The development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia

By

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The completion of this thesis marks the finale of my study as Health Sciences doctoral candidate at the University of Warwick, United Kingdom. It is therefore timely that I acknowledge significant individuals and in situations that have provided support and assistance throughout the pursuance of my Degree

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Last, but not least, thank you to my husband Marcellus and daughter Chelsea for being with me throughout the turbulence path of finishing the PhD. I owe a great deal to the Ministry of Health Malaysia for the support it provided in the form of study leave and scholarship.

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DECLARATION

I declare that this thesis is my own work. It has not been submitted for any other degree at another university. I asked permission from the Economic Planning Unit of the Prime Minister Department of Malaysia to conduct research in schools in Malaysia. I was responsible in recruiting the eight schools to pilot implementing the peer educator intervention, observing strictly to the consent procedures. In addition to this, I was also involved in recruiting and training the selected students to be peer educators by getting consent from the students' parent/guardian.

I prepared the peer educator module to be used in the peer educator training. The training of the peer educator was conducted with the support of manpower and financial from the Sabah Health Department. However, I was responsible in selecting and organised the venue, found and trained the facilitators and liaised with area health office to provide equipment for the training. I was present throughout the peer educator training and ensured the training was conducted according to the training module.

I identified the assessments used in the evaluation of the peer educator training and prepared the themes for focus group discussion to determine the practicality of the intervention to the students. I developed the quantitative questionnaire to capture the characteristics of participants, smoking behaviours, smoking intention and its components according to the Theory of Planned Behaviour, and smoking prevention activities in school, in consultation with Dr Wolfgang A. Markham.

I was responsible in every aspect of data collection at baseline, follow-up, during the peer educator training and during the focus group discussion. However, during the data collection at baseline and follow-up, I received help from the health staff of the Sabah Health

Department. In addition, two sessions of the focus group discussion were conducted by my friends, Mr Raisin Shim and Miss Froline Pius. I was also responsible in transcription and translation for the contents of the focus group discussion.

I have carried out all of the statistical analysis and interpretation of the quantitative data described in this thesis, with the advice from Dr Wolfgang A. Markham and Dr Peter Kimani on multilevel analyses. The thesis writing is my own but each chapter has been commented on by Dr Wolfgang A. Markham.

ABSTRACT

Objectives: To develop and evaluate the effectiveness of a school-based intervention for preventing the uptake of smoking among adolescents in the State of Sabah, Malaysia

Methods: The study design was a pilot randomised controlled trials with 7 months follow-up. A total of 1971 Form 1 students mostly aged 13 years old involved in the questionnaire. Eight secondary schools were randomly allocated equally to four intervention and control arms. The intervention schools received the health promotion activities as usual care and the peer educator intervention whereas the control schools received just the usual care of the health promotion activities. A total of 73 selected students were trained to be peer educators and given tasks to have an informal conversation and giving opinion about smoking issues and advocating not smoking norms. Individual-level analyses (relative risk and chi square analyses) and multilevel analyses which account for the clustering of students in schools were conducted. Three data sets were used from the complete data set, a data set that was comprised on students who could be matched at both baseline and follow-up and two data sets that were based on one of two assumptions. The first assumption was that baseline participants who could not be matched at follow-up retained their baseline smoking behaviour at follow-up. The second assumption was that baseline participants who could not be matched at follow-up were all regular smokers.

Results: The main finding was that the intervention had a significant positive effect on the smoking behaviour of baseline current smokers. That is baseline current smokers were less likely to have continued to be current smokers if they attended an intervention school. Five out of the nine tests supported this proposal including the most rigorous analyses which were all based on multilevel models**.** The impact of the intervention on baseline never smokers was less obvious as only one of the nine tests of significance indicated that the

intervention had a significant positive effect on follow-up smoking behaviour. In relation to baseline occasional smokers only two of the nine analyses indicated that the intervention had a significant positive effect on the smoking behaviour at follow-up. The analysis on interactions with friends in school showed that the intervention schools (43%) had a significantly higher proportion of students than in control schools (38%) who had a conversation about smoking issues.

Conclusion: The peer educator intervention is a promising approach in the smoking prevention programmes for adolescents in Malaysia.

CHAPTER 1

INTRODUCTION

In this introduction, I will describe the study locality and the reasons and rationale for choosing this particular topic for my PhD. Then I will lay out the aims, objectives and research questions of my project and provide an overview of each chapter in my thesis.

1.1 Background

1.1.1 Description of study locality

Malaysia is a country in Southeast Asia that has borders with Thailand, Indonesia, Singapore, Brunei and the Philippines. It is located close to the equator and therefore has a warm and humid tropical climate. Malaysia may be divided into two major regions, Peninsular Malaysia and Malaysian Borneo which are separated by the South China Sea. It is made up of thirteen States and three Federal Territories. The total population stands at approximately 28.3 million of which 91.8% are Malaysian citizens and 8.2% are non-citizens (Department of Statistics Malaysia, 2010). The population of Malaysia comprises many ethnic groups. The major ethnic groups in Malaysia are Malays (50.4%), Chinese (23.7%), Indian (7.1%) and the indigenous people of Sabah and Sarawak (11%) (Department of Statistics Malaysia, 2010). The ethnic composition of Peninsular Malaysia is different from that of the Malaysian Borneo States. In Peninsular Malaysia 63.1% are Malaysian citizens who describe their ethnicity as Malay. Malaysian Borneo is composed of two states the State of Sarawak and the State of Sabah. In the State of Sarawak the largest ethnic group are Ibans (30.3%) but in the State of Sabah the largest ethnic group are Kadazan/dusun (24.5%) (Department of Statistics Malaysia, 2010)

Sabah is the third largest state in Malaysia and it is located on the northern part of the island of Borneo. Administratively, the State of Sabah is divided into 25 districts. The most recent census conducted in 2010 indicated that the total population of Sabah numbered approximately 3.1 million and became the third most populous state in Malaysia after the state of Selangor and Johor. The population of Sabah consists of thirty three ethnic groups. Twenty eight of these ethnic groups are recognised as indigenous people. The ethnic composition of Sabah has been estimated as Kadazan/dusun (24.5%), Bajau (14%), Chinese (9.11%), Malay (5.7%), Murut (3.2%) and other indigenous people (13.9%). In addition to this, there are a large number of foreigners mainly from the Philippines and Indonesia and together these immigrants constitute about 27.8% (Department of Statistics Malaysia, 2010)

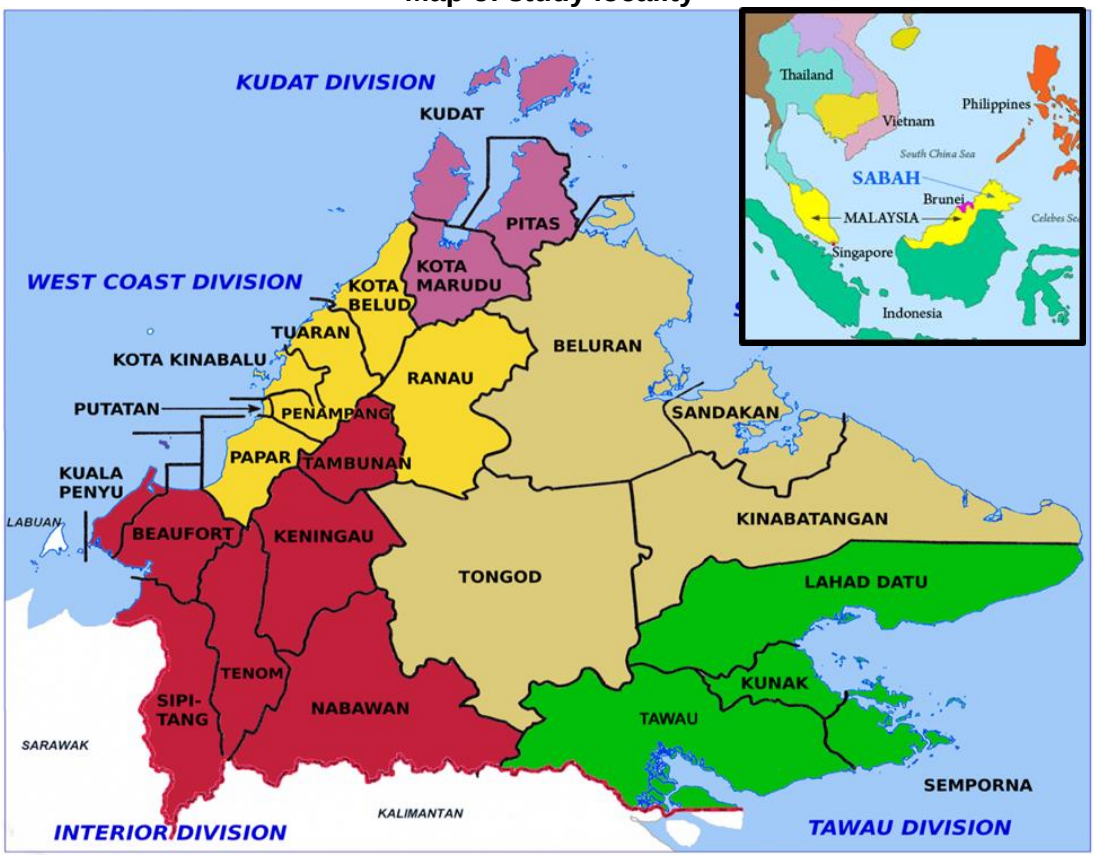
I chose to conduct my research project in two districts in the State of Sabah; the District of Kota Kinabalu and the District of Keningau (Figure 1.1). The distance between the main towns of these two districts is approximately 131km. The chosen districts together had urban, suburban and rural populations/communities. The District of Kota Kinabalu is located on the northwest coast of Borneo facing the South China Sea. Kota Kinabalu is the capital city of the Sabah State and according to the Malaysian Census 2010, has a population of 452,058. The city's population comprises of many different ethnic groups including Chinese (20.7%), Bajau (16.1%), Kadazan/dusun (15.5%), Malay (7.9%) and others (15.3%). In addition, Kota Kinabalu also has a large number of non-Malaysian citizens who constitute approximately 24.5% of the total population of the district (Department of Statistics Malaysia, 2010).

The District of Keningau is located in a valley surrounded by the Crocker Range to the west and the Trus Madi Range to the east and south. Keningau Town is the most prominent town in the interior part of the Sabah State. The district is famous for its sprawling timber and

agricultural activities. Based on the 2010 census the District of Keningau has a total population of 96,415 (Statistics Department of Malaysia in 2010). As with the other districts in the State of Sabah, Keningau is a multiracial town. The major ethnic communities are Kadazan/dusun (61.8%) and Murut (24.7%). Other ethnic communities include Chinese (9.4%) and Bajau (4.0%) (Department of Statistics Malaysia, 2010).

The District of Kota Kinabalu has a predominantly urban population while the District of Keningau has a predominantly rural population. The definition of an urban area differs from one country to another. The Malaysian Census (2010), defined urban areas as gazzeted areas with adjoining built-up areas which have a population of at least 10,000 people. A minimum of 60% of this population is required to be aged 15 years and above who are involved in non-agricultural activities. According to the Rural Master Plan, rural areas have agricultural and natural resources and a population of less than 10,000 people. Suburban areas are considered to be areas which have a population less than 10,000 people but suburban areas, unlike rural areas, do not have agricultural and natural resources.

Figure 1.1 :
Map of study locality



1.2 My motivation to do this project

I wanted to conduct research in adolescence health which focused on smoking prevention as a consequence of my experience of health promotion. My career has centred largely on promoting healthy behaviour and community empowerment toward maintaining a healthy lifestyle and environment. I would like to contribute to the evidence-base of health promotion interventions that could potentially make a difference in Malaysia either to policy, communities or to individuals. In addition, it was a part of the agreement in my study sponsorship by The Malaysian Government (The Ministry of Health) to undertake smoking prevention research.

As I come from an economically developing country where 4.7 million adults smoke from a total population of approximately 28.3 million and where more than 40% of men smoke

(WHO Western Pacific Region, 2013), I realised that preventing and stopping adults from smoking were huge and culturally challenging aims. When I was a child, while attending special occasions like weddings, I observed and remembered cigarettes were served to guests as a welcoming symbol especially for men. So I thought that developing a smoking prevention programme for adolescents might help to prevent the uptake of smoking as most adult smokers began smoking during their adolescent years (Robinson and Bugler, 2008; US Department of Health and Human Services, 1994).

Back in 2004, I was involved in piloting the implementation of the 'Young Doctor Programme' in two primary schools in the District of Keningau in the State of Sabah, Malaysia. This programme aimed to empower selected students to be role-models, promoters and motivators for their friends to practise healthy lifestyles. When I compared the attitudes and health knowledge of students in the intervention and control schools I realised schools were potentially important settings for implementing a smoking prevention programme for adolescents. Furthermore, before I started my study leave in 2009, I took up a state-level position at the Health Promotion Unit and one of my responsibilities was monitoring the progress of the 'Young Doctor Programme' in schools. As a consequence, I knew where to get help in relation to manpower and resources once I decided to evaluate a school-based smoking prevention intervention as part of my PhD. Most studies of school-based smoking prevention programmes have been implemented and evaluated in industrialised countries. The results of these studies might not be generalisable and therefore might not be applicable to economically developing countries due to differences in culture, economic status and limited resources. To my knowledge, mine is the first study in Malaysia that evaluates the effectiveness of a school-based smoking prevention intervention that aims to prevent the initiation of smoking.

1.3 Aim, objectives and research questions

My study aimed to develop and evaluate the effectiveness of a school-based intervention for preventing the uptake of smoking among adolescents in the State of Sabah, Malaysia. The school-based peer educator intervention was derived from the social influence approach.

The objectives of this study are stated below:

(1) To conduct a systematic review of randomised control trials of school-based smoking prevention interventions for adolescents.
(2) To develop a school-based smoking prevention intervention for adolescents aged 13 that draws on the findings of the systematic review and is therefore based on the best available evidence regarding the prevention of adolescent smoking.
(3) To conduct a process evaluation of intervention in order to determine the acceptability, fidelity and feasibility of the intervention.
(4) To evaluate the impact of the intervention on smoking behaviour
(5) To evaluate the impact of the intervention on smoking intention as described by the Theory of Planned Behaviour.

My study attempts to answer the following research questions:

(1) How effective is a school-based peer educator intervention at preventing the uptake of smoking among adolescents in Sabah, Malaysia?
(2) What recommendations can be made regarding future adolescent smoking prevention interventions in Malaysia?

1.4 Structure of thesis

This thesis has been structured into eight chapters. A brief introduction to these chapters is as follows:

Chapter 1 – Introduction

Chapter 2 – Review of literature

This chapter focuses on smoking issues among adolescents and a systematic review of school-based smoking prevention interventions.

Chapter 3 – Methods

This chapter describes the research governance and details of study design, recruitment of schools and participants, process of randomization and allocation of schools, description of the intervention, data collection and data analysis.

Chapter 4 – Background and characteristics of participants

This chapter details the location of participating schools and the characteristics of participating students in both intervention and control schools.

Chapter 5 - Process evaluation of peer educator intervention

This chapter focuses on evaluating the process of implementing the peer educator intervention.

Chapter 6 – Evaluation of the effects of the intervention on smoking behaviour

This chapter presents the impact of the peer educator intervention on smoking behaviour of participating students.

. **Chapter 7** – Evaluation of intervention on smoking intention according to the Theory of Planned Behaviour.

This chapter describes the impact of the peer educator intervention on the smoking intentions of participating students as described by the Theory of Planned Behaviour

Chapter 8 – Discussion and conclusion

This chapter 8 discusses the findings of the quantitative and qualitative analyses in relation to other published literature. It also outlines the strengths and limitations of the research and implications for future research.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Overview

This chapter is divided into two parts. The first part aims to set out the context of the smoking problem and the second part focuses on a systematic review of interventions in school that aim to prevent smoking uptake among young people. Describing the context helps to highlight the extent of the smoking problem worldwide and in particular in Malaysia and among adolescents. In order to understand the extent of the problem it is important to be precise about what is being discussed. To this end at the beginning of the chapter I have included definitions of adolescence and adolescent smoking behaviour. These definitions are supported by an outline of the prevalence of smoking and an outline of the effects of smoking. Smoking is the primary cause of premature death in Malaysia and has been estimated to be responsible for approximately 10,000 deaths per annum (MOH, 2003). Preventing smoking uptake particularly among adolescents is therefore a major public health strategy in Malaysia (MOH, 2003). Greater understanding of the predictors of adolescent smoking provides insights into the potential pathways through which adolescent smoking prevention interventions may exert their effects on smoking uptake. This understanding facilitates the development of adolescent smoking prevention interventions and additionally informs the choice of intervention that is implemented.

2.2 Definition of terms

According to the World Health Organization (WHO) adolescence is defined as young people between the ages of 10 and 19 years (WHO, 2010). Adolescence is a transitional period of physical and mental development which begins with the onset of puberty and ends when an adult identity has developed with established behaviours (See, 2010).

Adolescent smoking behaviour is defined in a variety of ways but all the definitions of adolescent smoking are different to the definitions used to define smoking behaviour in adulthood (Giovino, 2002). According to Lloyd and Lucas (1996), the categorization of adolescent smoking behaviour is based on three items. The first is a self-classification of smoking behaviour. The second is a self-estimate of number of cigarettes ever smoked. The third is a self-report of the time period since the last cigarette was smoked (Lloyd and Lucas, 1996). Never smoked is defined as self-reporting never having smoked in an adolescent's lifetime not even a puff (Giovino, 2002; IPH, 2008). Ever smoking, also known as lifetime smoking is defined as self-reporting to have smoked as little as a single puff of a cigarette during an adolescent's lifetime and includes adolescents who have already stopped smoking (Giovino, 2002; IPH, 2008). In the USA and unless stated otherwise for the purposes of this thesis adolescent current smokers are defined as those adolescents who self-report having smoked on one or more days during the previous 30 days (Giovino, 2002: IPH, 2008). Other definitions do exist however. Hence, in the UK the standard definition of adolescent smoking is defined as self-reporting regularly smoking at least one cigarette a week (Bewley at al., 1974).

2.3 Prevalence of smoking

The World Health Organisation (WHO) estimated that worldwide, 80,000 to 100,000 children begin smoking every day and half of those who smoke during their teenage years are expected to go on to smoke for 15 to 20 years (WHO, 2002). The Global Youth Tobacco Survey (GYTS) is a worldwide collaborative initiative organised by the WHO. According to the GYTS report for 2000-2007, which covered 151 sites in 117 countries, the overall prevalence of current smokers for young people aged between 13 to 15 years was 9.5%. The highest mean prevalence of current teenage smoking occurred in the European Region (19.2%) and the lowest in the Eastern Mediterranean region (4.9%). It was estimated that

20% of participating countries including Malaysia had a prevalence of adolescent current smokers in excess of 20%. (Warren et al., 2008)

The Malaysian National Health and Morbidity Survey (NHMS) which has been conducted since 1986 on a 10 yearly basis has shown that the prevalence of smoking among male adults aged 18 years and above is more than 40%. These studies also showed the prevalence of smoking varied greatly according to gender. In every survey, adult males were much more likely to report being a smoker than adult females. In the most recent survey, 46.4% of adult males and 1.6% of adult females were smokers. In addition, over the past two decades, smoking among adult females appears to be decreasing (Table 2.1) (IPH, 1986; IPH, 1996; IPH, 2006). Smoking is commonly considered to be normal behaviour among adult males in Malaysia (Lim et al., 2006)

Table 2.1
Prevalence of smoking in National Health & Morbidity Survey(NHMS), Malaysia in 1986, 1996 and 2006

	Prevalence of smoking (18 years and above)		
	NHMS I (1986)	**NHMS II(1996)**	**NHMS III(2006)**
Male	41%	49.2%	46.4%
Female	4%	3.5%	1.6%
Overall	**21.5%**	**24.8%**	**22.8%**

Source: Institute of Public Health, 1986, 1996 & 2006

It has been estimated that about 50 adolescents below the age of 18 years start smoking every day in Malaysia and currently one in five adolescents are smokers (Foong et al., 2005). According to NHMS II in 1996, the prevalence of smoking among adolescents below 18 years was 16.7%. The state of Sabah had the highest prevalence of adolescent smoking at about 30.3% and adolescent smoking was significantly higher in Sabah than in all the other states in Malaysia (Institute of Public Health, 1996). The third Malaysian NHMS which was conducted in 2006 estimated that the national prevalence of ever smoking among

adolescents was 14.7% and the greatest contribution to the national prevalence came from the states of Sarawak (22.2%), Melaka (19.6%) and Sabah (18.5%). The NHMS III reported a lower prevalence of adolescent current smoking (8.7%) (IPH, 2008). However, this figure might not be as accurate as the prevalence rate obtained in the NHMS II survey as the response rate in the NHMS III survey was only 61.7% while the response rate in the NHMS II survey was more than 80%. Based on the NHMS conducted in both 1996 and 2006, the prevalence of smoking among adolescents was significantly higher in rural areas than in urban areas.

The findings of GYTS which was conducted in Malaysia in 2003 indicated that the prevalence of current cigarette smoking among adolescents was about 20.2%. Although not yet in the public domain, the second wave of the GYTS has recently been completed, and will report current smoking prevalence among adolescents in Malaysia is 18.2% and ever smoking incidence amongst adolescents in the state of Sabah is 38.8% (Health Promotion Unit, JKNS., 2009). Current cigarette smoking prevalence among adolescents in Malaysia is significantly higher and almost double the prevalence of neighbouring countries such as Thailand, Indonesia, Philippines and Singapore (Sirichotiratana et al., 2008) (Table 2.2).

Table 2.2

Prevalence of smoking reported by students aged 13 – 15, by gender, Association of Southeast Asian Nation (ASEAN) member countries, Global Youth Tobacco Survey (GYTS) 2000-2009

Country	Year	Current cigarette smoking		
		Male (%)	Female (%)	Overall (%)
Malaysia*	2009	30.9	5.3	18.1
Malaysia	2003	36.3	4.2	20.2
Indonesia	2006	23.9	1.9	11.8
Philippines	2004	16.6	7.8	11.5
Thailand	2005	17.0	3.9	10.1
Singapore	2000	10.5	7.5	9.1
Laos	2003	10.2	0.7	5.5
Cambodia	2003	4.6	0.2	2.5
Vietnam	2003	1.5	0.8	1.2

*Source: Sirichotiratana et al., 2008, *GYTS Country Report 2009, MOH (Malaysia)*

Other studies in addition to NHMS and GYTS have been conducted on smoking among adolescents attending school in Malaysia. The prevalence of smoking among adolescents in these other studies varies according to locality, gender and age group. The range of current adolescent smoking prevalence in these other studies is 2.4% to 29.7% (Table 2.3). Most of the studies showed that more than 30% of male adolescents were current smokers whereas the prevalence of current smoking amongst female adolescents was below 8%. Half of male adolescents in Malaysia had at the very least attempted smoking (ever smoking) in their life time (WHO, 2006). The range of prevalence of ever smoking among Malaysian adolescents was 15.6% and 32.6% (Table 2.3).

Table 2.3

Summary of prevalence of smoking among adolescents (below 18 years old) by gender, status of smoking and research study in Malaysia

Study	Current smokers			Ever smoked		
	Male	Female	Overall	Male	Female	Overall
GYTS(Malaysia), 2009	30.9	5.3	18.1	46.7	12.4	30.0%
NHMS III, 2006	16.6%	0.7%	8.7%	-	-	-
Khairani et al., 2007	37%	-	-	-	-	-
Hammond et al., 2005	-	-	2.4%	-	-	23.1%
Lim et al., 2006	54.1%	4.3%	29.7%	-	-	-
Lee et al.,2005	26.6%	3.1%	14.0%	-	-	-
Naing et al., 2004	-	-	3.8%	-	-	15.6%
GYTS (Malaysia), 2003	36.3%	4.2%	20.2%	53.6%	11.4%	32.6%
Naing et al., 2001	35.9%	-	-	-	-	-
CDC, MOH, 1999	29%	8%	18.2%	-	-	-
Khadijah et al., 2000	33.2%	-	-	-	-	-
NHMS II, 1996	30.7%	4.8%	16.9%	-	-	-

2.4 Effects of smoking

Smoking is associated with increased risk of morbidity and premature mortality. Tobacco consumption is one of the leading preventable causes of death due to lung cancer, heart disease and other tobacco related diseases in the world today. It currently threatens the lives of one billion people worldwide (WHO, 2008). The Director-General of the World Health Organization, Dr Margaret Chan declared in 2008 that tobacco use killed more than 5 million people per year, an average of one person every 6 seconds and accounted for 1 in 10 adult deaths worldwide. If the current trend continues, the number of people dying from

tobacco related diseases will increase to more than 8 million a year by 2030. The use of tobacco may consequently be considered to be a world epidemic (WHO, 2008). Tragically, more than 80% of smoking related deaths occur in economically developing countries (WHO, 2008; CDC GYTS, 2008). In industrialised countries, tobacco use has been decreasing among adults. Additionally, among adolescents, fewer males initiate smoking. However, in economically developing countries, smoking rates are greater among males than females. In South East Asia for example, the adult male smoking rate is ten times higher than the adult female rate (WHO, 2008).

Most adult smokers start smoking during their adolescent years (Griffin et al., 1999). Tobacco smoking among adolescents is a major public health concern because of the risks of immediate or long term adverse health consequences such as asthma, chronic cough, cancers, chronic obstructive airways disease and cardiovascular diseases (Gilliland et al., 2006; U.S CDC, 1994). Adolescent smokers are also at greater risk than their non-smoker peers of developing cardiovascular disease later in life (Flouris et al., 2008).

Globally, 80,000 to 100,000 children begin smoking every day and half of those who smoke during their teenage years are predicted to go on to smoke for 15 to 20 years (WHO, 2002). In the USA, the majority of adolescent smokers smoked their first cigarette aged between 11 and 15 years (Conrad et al., 1992). Approximately, a third to a half of adolescents in the USA who experimented with cigarettes become regular users (Giovino et al., 1995).

Adolescents who begin smoking at an earlier age are more likely to be heavy smokers as adults (U.S CDC, 1994). Additionally, the younger adolescents are when they start smoking, the longer the period of time they will be users (U.S CDC, 1994). Furthermore, smoking cessation interventions have found it difficult to recruit adolescent smokers and adolescent

smokers who do enrol for cessation programmes, are more likely than adult smokers to drop out (U.S CDC, 1994).

Smoking in adolescence is a strong predictor of smoking in adulthood. Approximately 90% of adult smokers begin smoking before the age of 20, with 50% beginning before the age of 14 (US Department of Health and Human Services, 1994). Studies have also found that those who started smoking early in life have greater difficulty in stopping (Epps et al., 1995, Heischober et al., 1997, Siquera et al., 2000). Compared to adult smokers who started smoking after they were 16 years old, adult smokers who started to smoke before the aged of 16 years were twice as likely to be unsuccessful in their attempts to quit smoking (Khuder et al., 1999).

Smoking prevalence in Malaysia is amongst the highest globally. Since the 1980s and more recently, cigarette smoking in Malaysia has become the primary cause of premature death in this country (MOH, 2003). Tobacco-related conditions, particularly, cardiovascular, cerebrovascular and respiratory diseases, and several cancers, account for the largest proportion of premature mortality in Malaysia (MOH, 2003). It has been estimated that in Malaysia smoking accounts for 1 out of every 5 deaths, and ~10,000 deaths per annum (MOH, 2003). Smoking causes significant morbidity and accounts for at least 15% of Malaysian hospital admissions (Information and Documentation System. 2006). The cost of treating smokers in Malaysian public hospitals for ischemic heart disease, lung cancer and chronic obstructive airway diseases is estimated to constitute half of the annual health budget (MOH, 2006; Tan et al, 2009).

Approximately 40% of the total population in Malaysia are aged below 20 years (Department of Statistics Malaysia, 2010). Smoking is a major problem among adolescents in Malaysia. A survey by the Ministry of Youth and Sports indicated that 80% of 5,860 adolescents had

experimented with smoking (Naing et al., 2004). Prevalence estimates converge at around 29% among 13-15 year olds. Thus, preventing adolescents from starting to smoke is an important public health strategy. Population interventions have had little measurable impact on smoking uptake. Most young people attend school. Hence, school-based smoking prevention interventions have substantial potential for extended reach and measurable impact (Sussman et al., 1995).

2.5 Tobacco control in Malaysia

The Malaysian government has implemented numerous tobacco control and prevention activities during the past two decades. In 2000, Malaysia signed up to the WHO Framework Convention on Tobacco Control (FCTC) process and the secretariat for FCTC was established locally to supervise compliance with the requirements of the FCTC. The FCTC was developed in response to the globalization of the tobacco epidemic (WHO 2003). The enactment of tobacco product regulations has strengthened the legislative control of advertising, sponsorship and sale of tobacco products. Advertising of tobacco products including brand names and sponsorship using cigarette and tobacco brand names are prohibited. The Malaysian government has also implemented a law that requires retailers to sell a minimum of 20 cigarettes per cigarette pack (MOH, 2010). In Malaysia, it is illegal to sell cigarettes in loose form or to place tobacco products in vending machines. The number of smoke-free areas in public places has increased and includes education institutions, offices, libraries, internet cafes, hospitals and health clinics, shopping complexes and buildings for worship (IPH, 2008). Health warning labels with pictorial adverse effects of smoking are required to be imposed on cigarette packets to inform consumers of the dangers of tobacco use (IPH, 2008). Between 2004 and 2006, the Malaysian government increased cigarette taxes by more than 53% to combat the consumption of cigarettes (Tan et al, 2009).

2.6 Tobacco prevention in Malaysia

In 2007, there were 294 health facilities in Malaysia providing smoking cessation services for smokers to quit smoking through counselling and pharmacotherapy. In addition, the tobacco 'infoline' and the 'quitline' were created to provide smokers with additional access to cessation assistance, support and advice (IPH, 2008). A nationwide "Tak Nak" (translated as don't want in Malay language) mass media anti-smoking was launched in early 2004 which cost about RM100 million. This campaign aims to facilitate increased awareness and educate the public about the adverse effects of smoking and thereby reduce the likelihood of smoking uptake among non-smokers, particularly adolescents (IPH, 2008; Tan et al, 2009). An evaluation of this campaign showed a high level of penetration. Approximately 93% of adult smokers, adult non-smokers as well as adolescents were exposed to the campaign messages (Fong et al, 2005).

My research project supports the Tak Nak mass media campaigns organised by the Malaysian government by focusing on the prevention of smoking initiation. The school-based smoking prevention intervention I helped to develop and I then evaluated aimed to both increase awareness and knowledge and to facilitate the development of life skills that would enable and encourage adolescents to adopt a healthier lifestyle without tobacco.

2.7 Predictors of smoking initiation in adolescents

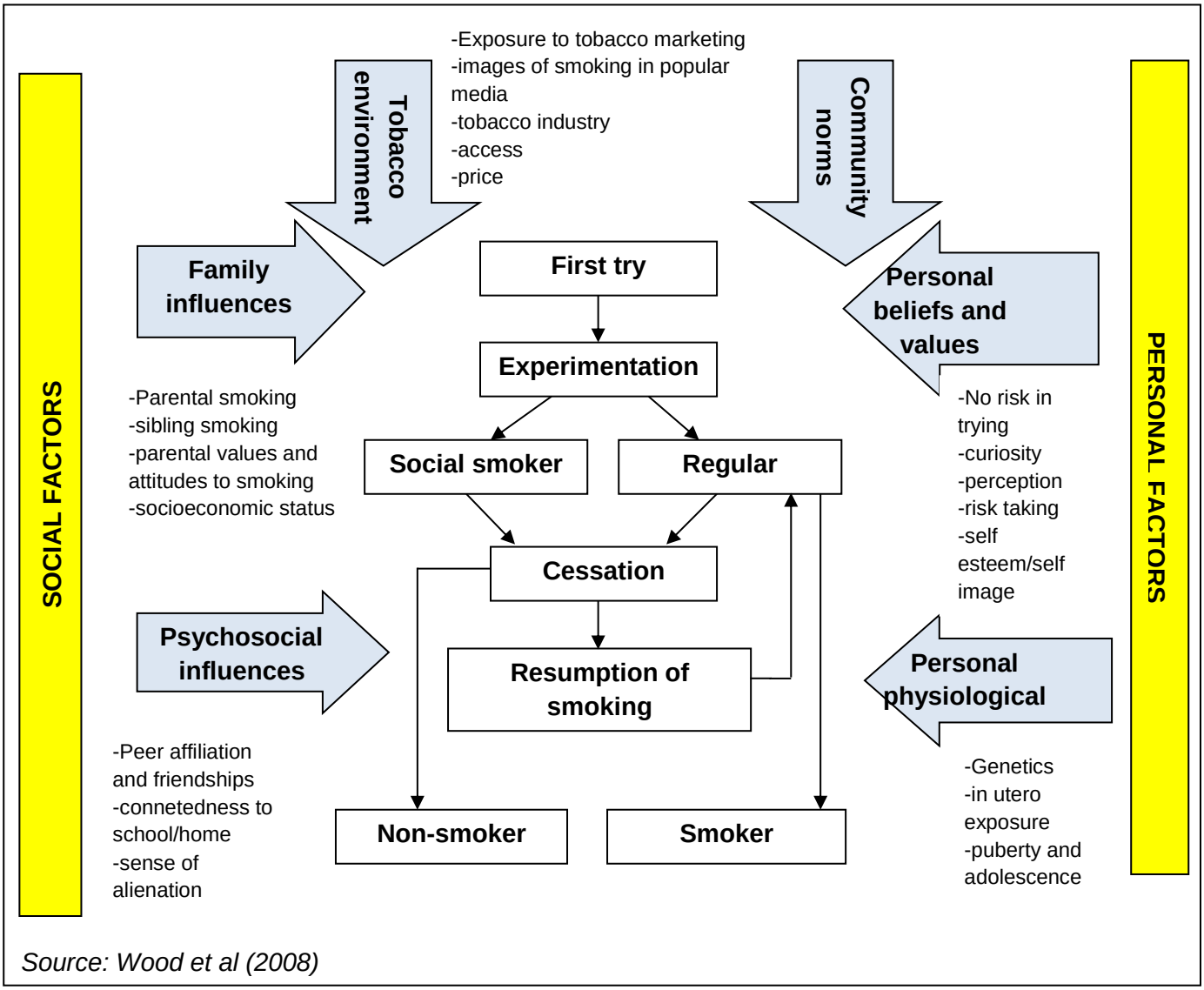
In Malaysia, the 3rd NHMS survey found that the mean initiation age among current adolescent smokers was 13 years for boys and 14 years for girls (IPH, 2008). The process of becoming a smoker during adolescence encompasses several different stages. Flay et al. (1994) outlined a four stage model of adolescent smoking. The stages are preparatory stage, trial stage, experimental stage and regular use stage. Identified predictors mark each stage. At the preparatory stage, adolescents' curiosity regarding smoking underpins their knowledge, beliefs and expectations about smoking. The trial stage involves initiation or first trial which usually occurs in the presence of friends and is prompted by self-curiosity about smoking. The experimentation stage involves repeated trials of smoking over an extended

period perhaps several years but not on a regular basis. Adolescents who are classified as experimenter smokers might smoke in specific situations or at specific events, such as at parties, on weekends and with special friends. At regular use stage, adolescents smoke tobacco on a regular basis either weekly or monthly. Some adolescents advance to nicotine dependence and show addiction to smoking (Flay et al., 1994). Any interventions or initiatives that aim to deter the initiation of smoking among adolescents are interpreted as the prevention of smoking in this study.

Previous studies have found that the predictors of smoking initiation during adolescence are multi factorial (Milton et al, 2008; Kelishadi et al, 2007) and interrelated (Simon-Morton, 2002). The Theory of Triadic Influence which was outlined by Flay & Petraitis (1994) (Figure 1) helps to illustrate the interrelated influences on adolescent uptake of smoking. This theory focuses on personal, social and environmental factors which influence adolescent smoking uptake. Personal factors include the individual's sense of self, social competence, self-efficacy and self-determination. Social context encompasses the influence of family and friends through their behaviour and attitudes towards smoking which affect the young person's perception of normative behaviour. Environmental factors include the cultural context, the information environment and legislative and policy issues that affect cigarette pricing and the availability of tobacco. These factors influence knowledge, expectancies, values and evaluations which affect the young person's attitudes towards smoking. The combined effects of the personal, social and environmental factors in each adolescent's life determine his/her decision regarding whether or not he/she should smoke (Turner et al., 2004; Flay, 1999; Flay et al., 1994).

Figure 2.1

Theory of Triadic Influence



Source: Wood et al (2008)

The uptake of smoking among adolescents is influenced by the surrounding environment and the people with whom adolescents mix (Naing et al., 2004). Peer influence is widely believed to be an important influence on adolescent smoking initiation (Zhu et al, 1996; (Rapeah et al., 2008; Khairani et al., 2007; Lim et al., 2006, Norbanee et al., 2006; Naing et al., 2004;Teh et al., 2000; Zhang et al., 2000). Commonly, young people's first attempts at smoking occur with peers and the peer group may provide expectation, support and cues for continuous experimentation (US DHHS, 1994).

Smoking among adolescents was found to be correlated with the smoking habits of the family members of the adolescent (Talay et al., 2008; Bricker et al., 2006; Flay et al., 1998; Zhu et al., 1992). Family members who are smokers not only provide adolescents with easy access to cigarettes but also encourage adolescents both directly and indirectly to experiment with tobacco use (Zhang et al., 2000, Dusenbury et al., 1992). Parental smoking habits have been shown to be significantly correlated with both initiation and early onset of smoking amongst adolescents (Khuder et al., 2008; Biglan et al., 1995). Mothers play an important role in shaping the behaviour of their young children (Khuder et al., 2008). Young people whose mothers smoke are twice as likely to initiate smoking (Khuder et al., 2008). Additionally, adolescents whose mothers smoke tended to initiate smoking at younger age (Khuder et al., 2008).

The transition from smoking initiation to experimental smoking during adolescence is also significantly influenced by the smoking habits of the siblings of young people (Bricker et al., 2006). Adolescents who have siblings who smoke are at increased risk of smoking initiation and early onset of smoking (Khuder et al., 2008).

Several studies have been conducted in Malaysia to identify the factors that are associated with smoking uptake during adolescence (Table 2.4). Most of the studies indicated that peer influence was the strongest factor influencing smoking initiation followed by young peoples' curiosity and parental and sibling influence. Other factors associated with adolescent smoking uptake were experiencing stress, poverty, low achievement at school and living in a rural area.

Table 2.4

Reasons for Smoking among Adolescents in Malaysia

Researchers	Factors	Participants
Rapeah et al., 2008	Curiosity, peer influence, adult influence, stress.	male, 16 yrs
Khairani et al., 2007	Curiosity, peer influence, stress.	16 -17 yrs
Lim et al., 2006	Peer influence, sibling influence, low achievement in academic.	16 yrs
Norbanee et al., 2006	Peer influence, curiosity.	primary students
Lee et et al., 2005	Parental influence, poor, rural, mental problem.	13 -19 yrs
Naing et al., 2004	Peer influence, sign of maturation, parental influence.	male, 16-17 yrs
Teh et al., 2000	Peer influence, curiosity.	rural, 15-17 yrs
Shamsuddin et al., 2000	Parental influence, sibling influence, lack of supervision from family peer influence, poor.	male, 16 yrs

2.8 Systematic Review of school-based smoking prevention programmes

2.8.1 School-based smoking prevention programmes

Over the past three decades, researchers have developed and evaluated many school-based smoking prevention programmes (Flay, 2009). There is, however, inconsistent evidence concerning their effectiveness. A number of factors are believed to underpin the inconsistent findings including variation in intervention/programme content features and structures, targeted age groups and the experience of the people who deliver the programme (Stead et al., 1996; Glantz et al., 2005; Thomas & Perera., 2006).

Lloyd et al., (2000) reasoned that the most critical window of opportunity for school-based smoking prevention programmes appeared to be in the late primary to early secondary school years. The majority of adolescents experiment with their first cigarette during the late primary and early secondary school years (Conrad et al., 1992; Stanton et al., 1992; Zhang

et al., 2000). Zhang et al., (2000) concluded that the early adolescent years are important years in the smoking onset process for adolescents. School-based smoking prevention programmes have been found to delay the onset of smoking among children and adolescents (Cancer Council, 2008; Storr et al., 2002; WHO, 1998). Permanent non-smoking status is the primary outcome. That is preventing never smokers from initiating smoking. However, delayed onset is nonetheless an important public health outcome as mortality rates are lower and quitting rates are higher among smokers who start smoking at a later age (Cancer Council, 2008; Stead et al., 1996). Adolescents who start smoking at a relatively young age tend to be heavy smokers and are less likely to quit smoking (Storr et al., 2004; Escobedo et al., 1993).

A school-based setting is an excellent way to reach adolescents because the majority of young people attend school (Lynagh et al., 1997). School-based smoking prevention interventions have the potential to be more effective than other types of adolescent smoking prevention interventions for four reasons. First, the delivery of school-based smoking prevention programmes during school hours will reach most of the adolescents that it is intended to reach. Second, most schools are required to provide health education. Third, adolescents attending school are provided with opportunities for the types of social and practical face to face learning that is thought to underpin effective smoking prevention interventions. Fourth, it is possible to undertake optimal programme monitoring and evaluation because students are pooled in one place (Sussman et al., 1995).

In a systematic review of school-based smoking prevention programmes, Thomas & Perera (2006) categorized the included studies into five groups based on the type of intervention. The five groups included information giving, social competence, social influence approaches, combined methods of social competence and social influence and multi modal programmes. Each of these types of behavioural intervention is based on a different orientation. The

information giving intervention provides information about smoking, health risks of tobacco use and the prevalence and incidence of smoking (Bangert-Drowns, 1988) and is based on the assumption that information alone will facilitate healthy lifestyle choices. Interventions that focus entirely on information giving are however typically ineffective in promoting healthy lifestyle choices (Botvin, 1999; Sussman, 1993; Hansen 1991). The highest effect sizes of knowledge based interventions on smoking prevention occur shortly after the intervention has been completed but fade after 1 year (Hwang, 2004).

Social competence interventions are based on Bandura's social learning theory which posits that adolescents learn to use tobacco through modelling, imitation and reinforcement which are in turn influenced by adolescents' pro-tobacco cognition, attitudes and skills (Bandura, 1977). Adolescent smoking prevention programmes that draw on Bandura's social learning theory commonly also focus on self-management skills, personal and social skills and cognitive skills such as goal-setting, problem solving, decision making, handling media and interpersonal influences, enhancing self-esteem and stress management (Thomas & Perera, 2006).

Social influence approaches are based on persuasive communications theory (McGuire, 1968) and the theory of psychological inoculation (Evan, 1976). Adolescent smoking prevention interventions that are based on these theories focus on normative education methods and anti-tobacco situations, increasing awareness of media, peer and family influences, teaching and practicing refusal skills and making a public commitment not to smoke (Thomas & Perera, 2006).

Adolescent smoking prevention programmes that are categorised as multi-modal programmes combine curricular approaches with broader initiatives within and beyond the

school, including programmes for parents, schools or communities and initiatives to change policies on taxation, sale, availability and use of tobacco (Thomas & Perera, 2006).

Some forms of peer resistance and social skills programmes for secondary school students draw on social psychological concepts and principles in order to promote resistance to peer pressure to smoke and to build social skills that might help adolescents avoid smoke onset (Ellickson et al., 1990; Botvin et al., 1995; Storr et al., 2002;). However, these programmes do not seem to work for adolescents who have started to smoke before the programmes are implemented (Storr et al., 2002; Jackson et al., 1997; Ellickson et al., 1990).
Interventions based on a social influence and social norms orientation are reported to be effective in preventing smoking onset among adolescents attending school (Bruvald, 1993). These interventions have included peer-led activities, role modelling successful non-smoking peers, role play and discussion and problem solving (Bruvald, 1993).

Interventions led by peers are believed by some to be more effective than interventions led by adults (Bell et al., 1993). School-based smoking prevention programmes that are delivered by older peer leaders to younger students are found to facilitate increased students' knowledge of health and social parameters relating to smoking (Santi et al., 1994). The role of peer-leaders is important as it helps younger students to develop their ability to resist social pressure to experiment and smoke regularly (Telch et al., 1990; Santi et al., 1994).

In summary, inconsistent evidence does little to reduce uncertainty about the effectiveness of school-based smoking prevention programmes. Despite the public health importance of preventing the uptake of smoking among young adolescents and the benefit of almost universal reach afforded by the school context, the evidence base fails to inform decision making in this context.

2.8.2 Objectives

The purpose of this study was to systematically review school-based smoking prevention programmes aimed at adolescents. The specific objectives were to evaluate the effects of school-based smoking prevention programmes on smoking uptake among never smokers at baseline and to investigate programme characteristics as potential sources of effect heterogeneity. Results of this review will help to develop more effective programmes that target adolescents and aim to prevent the uptake of smoking.

2.8.3 Eligibility criteria

Studies were selected based on several inclusion criteria. The studies included in this review met all of the following criteria:-

i) Study design : RCT

ii) Participants : Adolescents (aged 11 to 18 years)

iii) Intervention : School-based smoking prevention programmes

iv) Outcome : Smoking prevalence

v) Follow-up: At least 6 months from the baseline data collection.

2.8.4 Search and information searches

Studies were identified by searching the following databases for the time period 2000 to 2010: MEDLINE (OVID), EMBASE, and Cochrane Database of systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials, ASSIA, CINAHL and PsycINFO. The time period was limited to 2000 to 2010 because this review sought to identify the latest evidence based studies which were most relevant to the current situation. The search terms that were used to search the electronic databases are shown in Appendix 2.1. In addition, reference lists of relevant review articles, meta-analyses and selected articles were hand searched and assessed in

order to discover additional relevant studies that had not been identified through the searches of the electronic databases. Abstracts or full articles that were identified through these searches were reviewed in order to determine if the studies reported in the articles met the eligibility criteria for review.

2.8.5 Selection of studies

Data extraction

A simplified data extraction sheet that was based on the Cochrane Consumers and Communication Review Group's data extraction sheet (Appendix 2.2) was developed in order to extract data systematically from the identified studies.

Risk of bias

Studies were assessed for risk of bias in the following six areas as follow:-

i) Randomization

Allocation to trial arms should follow a completely random sequence. That is, the process that determined the allocation sequence should be random, e.g. tossing a coin, computer-generated random sequence, or random number tables.

ii) Concealment

The process of concealment ensured that the allocation sequence was not known before enrolment was confirmed.

iii) Follow-up completeness

At least 80% of baseline participants in both the intervention and control groups completed the outcome assessment at the primary endpoint.

iv) Bio chemical validation

The standard measures for sensitivity and specificity of self-reports of smoking have greater validity if they are verified biologically. Biological verification involves taking breath and saliva samples which are examined for carbon monoxide, salivary

cotinine and salivary thiocyanate.

v) Intention to treat

Intention to treat analyses were performed to avoid the effects of loss at follow-up which may potentially negatively affect the randomization of participants to the intervention and control groups in a study. All participants who were recruited to the study were included in the analysis of outcomes, and analysed in the groups to which they were allocated.

vi) Unit of analysis

It is considered to be appropriate if the analyses are at the same level as the unit of randomization; for example, if the unit or randomisation is the school, then the analysis should take account of clustering effects by either controlling for school in the analysis, or by analysing data at the school level.

Studies were categorized into one of three risks of bias levels:

i) Low risk: all 'yes 'in six areas of study quality.

ii) Moderate risk: No more than 2 'Unclear (UC)' and the rest are 'yes'.

iii) High risk: more than 2 'Unclear (UC)' or 1 or more 'No'.

2.8.6 Data synthesis strategy

Trial-level effect estimates

The main outcomes were reported as dichotomous data to either smokers or non-smokers, for which the primary endpoint of interest was 12 months. The summary measure of the treatment effect was the OR with associated 95% confidence interval (95% CI) calculated in accordance with the intention-to-treat principle and adjusted to account for cluster design using the Comprehensive Meta-Analysis (CMA) software. For intention to treat analyses, all participants who were lost at follow-up were added back into the analysis as smokers. If the

proportion of control participants lost at follow-up was greater than 10% of the proportion lost to follow-up in the intervention group, we assumed the proportion of smokers in the control group was the same as in the intervention group with the remaining control participants returned as non-smokers. This assumption was made because if all lost data in control group were assumed as smokers, it would bias results in favour of the intervention.

Data from participants in cluster RCTs cannot be considered independent, since differences between participants in the same cluster will be smaller than differences between participants in different clusters.

Data synthesis

Adjusted odds ratios from studies were obtained by adjusting the reported odds ratio using an interclass correlation coefficient (ICC) of 0.02. This allowed the pooling estimate of effect of both overall and individual studies. In this review, effects were based on intention to treat adjusted analysis. Data were pooled using the random-effects model, which assumes that variation between trial-level effects can reflect differences both within and between trials.

Heterogeneity was assessed by visual inspection of forest plots and statistical tests. Heterogeneity was assumed to be absent if trial-level effects were in the same direction, and confidence intervals overlapped. The assumption of homogeneity was tested with I^2 (Higgins 2003), which describes the proportion of variation between effect estimates that is greater than chance. The interpretation of I^2 is as follows:-

0% to 40%	:	might not be important
30% to 60%	:	may represent moderate heterogeneity
50% to 90%	:	may represent substantial heterogeneity
75% to 100%	:	considerable heterogeneity

Sensitivity analysis assessed the robustness of overall findings against analytic decisions. In sensitivity analysis the synthesis is repeated, but without trials for which there may be concern about the relevance of the data. If the pooled estimates differ markedly, the overall findings cannot be considered robust.

2.8.7 Results

Included studies

The selection of included studies is shown in Figure 2.2. A total of 4,805 citations were identified by searching through electronic databases and hand searching. Citations from several databases were downloaded to the bibliographic software Endnote to be screened and to check for duplication. Most of the studies were excluded outright by looking at the relevancy of titles and abstracts against the inclusion criteria. One hundred and ninety-two full text articles were assessed against eligibility criteria by using data extraction template (Appendix 2.2). Articles were excluded due to differences in study design, target group, setting of intervention, duration of follow-up and outcome measure. Forty eight excluded RCT studies are summarized in Appendix 2.3. Only six articles met the eligibility criteria.

Study characteristics

Study characteristics are summarized in Table 2.5. All six included studies were randomised controlled trials and carried out in different countries. Four studies were conducted in the Netherlands, USA, Finland and several European countries (Italy, Spain, Germany, Greece, and Austria) while the other two studies were conducted in an economically developing country namely China. The included studies involved 18,820 students from 230 schools. The age range of participating students was 12 to 14 years. The included studies used three types of interventions. These interventions were based on the social influence approach (Faggiano et al.,2008; Vartiainen et al., 2006 and Crone et al., 2003), the social normative approach (Chou et al., 2006 and Unger et al., 2004) and health education and environmental

intervention (Wen et al., 2010). The implementers of the intervention were teachers (Faggiano et al., 2008; Vartiainen et al., 2006 and Crone et al., 2003), health educators (Chou et al., 2006 and Unger et al., 2004) and a combination of teachers and nurses (Wen et al., 2010). The duration of the follow-up ranged from 8 months to 36 months. The outcome measure of interest was smoking prevalence among participants classified at baseline as 'never' smokers. Never smokers were those who at baseline reported never smoking in their lifetime (Giovino, 2002)

Figure 2.2
Flow of selecting studies for review

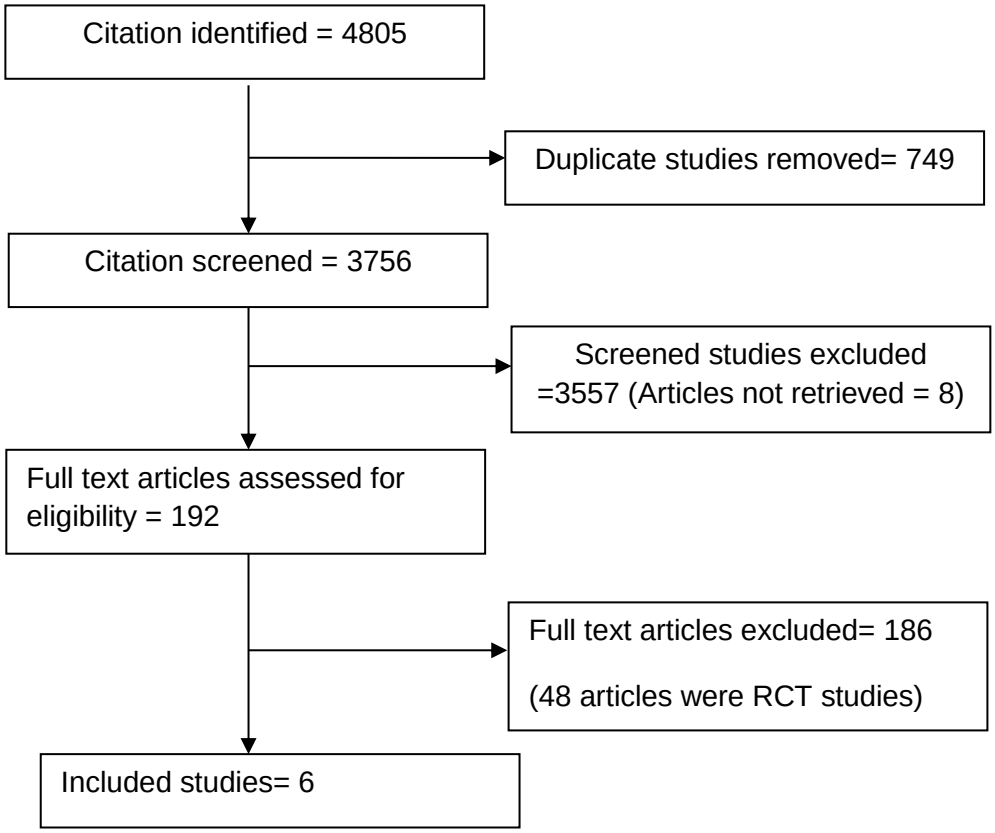


Table 2.5

Characteristics of school-based smoking prevention programmes

Study	N. participants N schools	Participant	Provider Setting	Intervention	Follow-up	Results
Chou et al., 2006 (China)	• n=2661 • 14 schools	• 7th grade • mean age=12.5yrs • 52.3% boys •	• health educator (US trained) • classroom	**IG: Social normative approach** • 13 lesson (1 lesson(45 min)/week)	12 months	• Not significant in preventing smoking experimentation among non-smokers at baseline • Potential effect in preventing the progression of smoking
Crone et al., 2003 (Netherlands)	• n=2562 • 26 schools	• 13 yrs • % boys	• Teachers • classroom	**Social influence** • 3 lesson on knowledge, attitude and social influence • Class agreement not to start smoking & stop smoking next 5 months • Video lesson & social influence Competition	12 months	• Short term period: significant in reducing initiation of smoking but after 1 year not significant.
Faggiano et al., 2008 (Europe-Italy, Spain, Germany, Belgium, Sweden, Greece, Austria)	• n=7079 • 143 schools (IG=78, CG=65)	• 12-14 yrs • % boys?	• Class teachers • with peers • classroom	**IG: EU-Dap school prevention programme (unplugged)** • based on social-influence approach • 12 one-hour unit/week Delivered in 3 formats: basic curriculum alone (basic arm), or with the addition of peers (peer arm) or parents(parent arm)	8 months	• Significant differences in preventing baseline never and sporadic smokers to daily smokers • Not effective to red**u**ce or stop daily smokers.

Unger et al., 2004 (USA)	• n=1430 (never smokers at baseline) • 16 schools	• 6th grade students • Majority (%) hispanic, /females •	• health educator • classroom	**IG: Multicultural curriculum** (social norms & refusal skills)with cultural references • 8 weekly classroom sessions	12 months	• Overall no significant differences in preventing initiation of smoking but significant in preventing smoking initiation among Hispanic boys •
Vartiainen et al., 2006 (Finland)	• n=2745 • 27 schools (IG=13, CG=14)	• 7th grade • mean age=13.8 yrs • 53% boys •	• Teachers (trained & received manual programme) • classroom	**IG: Standard health education curriculum + ESFA Prevention programme** (attitude, social influence, self-efficacy model) • 14 lessons (5 lessons for 1st & 2nd year, 4 lessons for final year.	36 months	• Significantly preventing the never smokers to weekly smokers. • No significant differences in smoking behaviour
Wen et al., 2010 (China)	• n=2343 4 schools (IG=2, CG=2)	• 7th & 8th grade • Mean age=13.4 yrs • 52% boys	• School nurses & teachers (attended 8 hours training) • Classroom	**IG: Health education & environmental intervention** • based on socio-ecological framework & the PRECEDE-PROCEED model	24 months	• Not significant differences in smoking initiation • Significant differences in prevention progression of experimental to regular smokers

Risk of bias

Overall the internal validity of studies showed a high risk of bias (Table 2.6). Only two studies (Wen et al., 2010; Crone et al., 2003) adopted adequate randomization and concealed allocation processes. Three studies had a low risk of bias due to follow-up incompleteness (Wen et al., 2010; Chou et al., 2006; Unger et al.,2004). Only Vartiainen et al. (2006) validated smoking status through biochemical testing. Inadequate reporting prevented the assessment of adequacy in numerous domains.

Trials level effects

In this review the effect measure was the odds ratio with 95% confidence interval which were analysed and presented at reported (follow-up), ITT and ITT adjusted. Effect measure of never smokers at baseline to ever smoking at 12 months follow-up is presented in Table 2.7

Table 2.6

Quality measures of the randomized controlled trials that failed to fulfil any one of 6 markers of validity

Study	Risk of Bias Criteria						Category of studies
	Randomization	Concealment	Follow-up Completeness	Validation (Bio-chemical)	Intention to treat	Unit of Analysis	
Chou et al., 2006 (China)	UC	UC	Yes	No	No	Yes	High risk
Crone et al., 2003 (Netherlands)	Yes	Yes	No	No	Yes	Yes	High risk
Faggiano et al., 2008 (Europe)	UC	UC	No	No	No	Yes	High risk
Unger et al., 2004 (USA)	UC	UC	Yes	No	No	Yes	High risk
Vartiainen et al., 2006 (Finland)	UC	UC	No	Yes	No	Yes	High risk
Wen et al., 2010 (China)	Yes	Yes	Yes	No	No	Yes	High risk

Table 2.7

12-month effects of school-based smoking prevention programmes on smoking prevalence among never smokers, estimated under different assumptions

	Baseline	Reported			ITT			ITT Adjusted*		
Study	**N**	**N**	**n+**	**n-**	**N**	**n+**	**n-**	**N**	**n+**	**n-**
Crone et al., 2003		**0.46 (0.34, 0.64)**			**0.59 (0.48, 0.72)**			**0.59 (0.47,0.74)**		
Intervention	1157	518	111	407	1157	750	407	964	625	339
Control	852	327	121	206	852	646	206	710	538	172
Faggiano et al., 2008		**0.86 (0.71, 1.05)**			**0.95 (0.85, 1.08)**			**0.95 (0.84, 1.09)**		
Intervention	3089	2597	223	2374	3089	715	2374	2574	596	1978
Control	2985	2516	247	2269	2985	716	2269	2488	597	1891
Unger et al., 2004		**0.69 (0.47, 1.01)**			**0.86 (0.67, 1.09)**			**0.86 (0.65, 1.11)**		
Intervention	752	625	60	565	752	187	565	627	156	471
Control	678	564	75	489	678	189	489	565	158	407
Vartiainen et al., 2006		**0.48 (0.34, 0.68)**			**0.77 (0.63, 0.95)**			**0.77 (0.61,0.97)**		
Intervention	756	578	58	520	756	236	520	630	197	433
Control	913	708	133	575	913	338	575	761	282	479
Wen et al., 2010		**0.72 (0.50, 1.05)**			**1.00 (0.80, 1.26)**			**1.00 (0.78, 1.29)**		
Intervention	1157	1012	80	932	1157	225	932	964	187	777
Control	866	565	60	505	866	168	698	722	140	582

n+ = smokers; n- = non-smokers

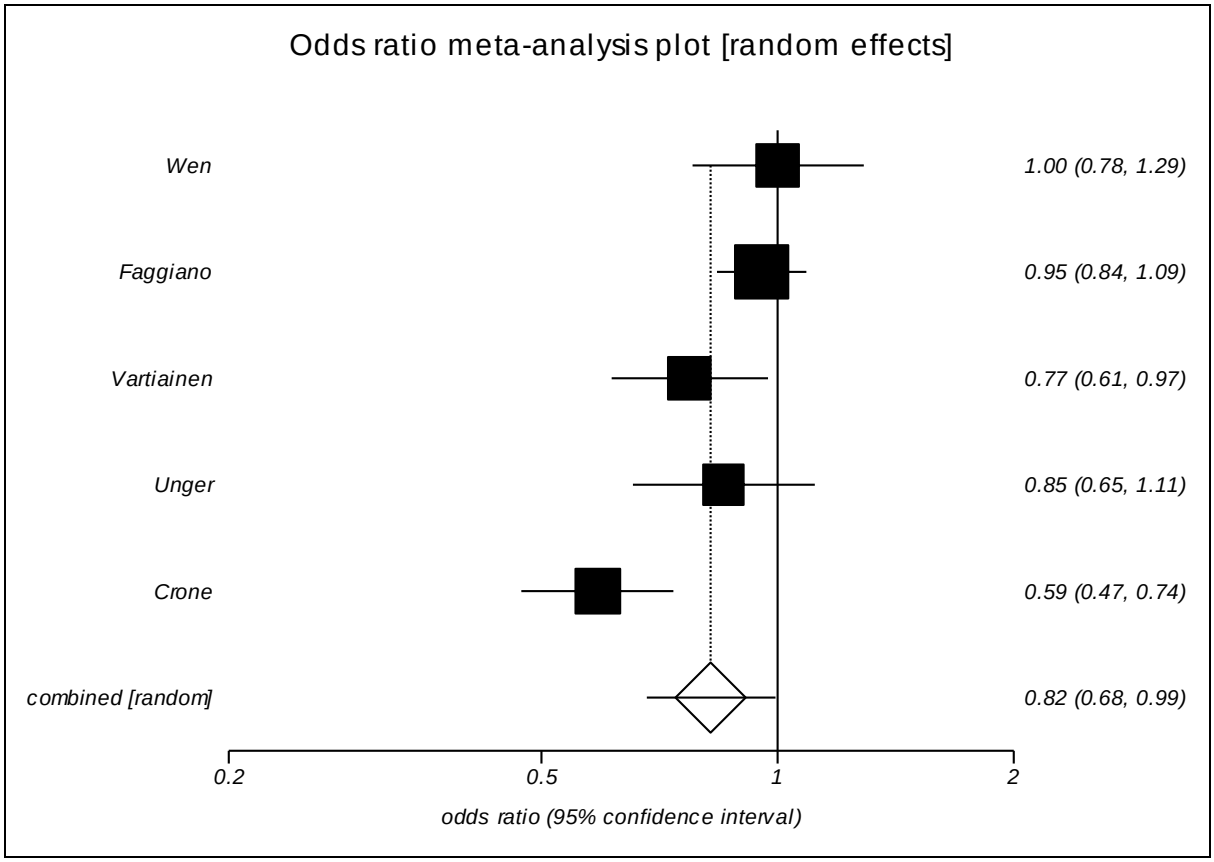
*Sample size adjusted by design effect of 1.2 (n/DE)

Data Synthesis

Chou et al. (2006) reported insufficient data to be included in the pooled analysis. The pooled analysis of data from five trials showed a statistically significant association between intervention and smoking prevalence at 12 months (OR = 0.82, 95%CI = 0.68 to 0.99). Specifically, the pooled estimate indicates that adolescents allocated to a smoking prevention intervention were 18% less likely to be classified as smokers at 12 months. There was, however, evidence of statistical heterogeneity among the pooled effect estimates (I^2 = 75%; p = 0.04) (Figure 2.3)

Figure 2.3

Pooled analysis of ITT adjusted effect estimates for smoking prevalence



Sensitivity Analysis

Separate syntheses were conducted in which both Wen et al. (2010) or Faggiano et al. (2008) were excluded. Wen et al. (2010) was excluded because loss to follow-up was disproportionately large among controls, whilst in Faggiano et al. (2008) the follow-up period was 8 rather than 12 months. The pooled estimates yielded by the sensitivity analyses were comparable to the pooled estimate obtained in the main analysis. (Table 2.8). (Appendix 2.4)

Table 2.8
Odds Ratio (OR) with 95%CI for sensitivity analysis

Sensitivity analysis	Combined [random] (OR with 95% CI)
Overall studies	0.82 (0.68,0.99)
Without Wen et al study	0.79 (0.63,0.98)
Without Faggiano et al study	0.79 (0.63,0.98)

2.8.8 Discussion of findings and conclusions

Main Findings

The findings of this review are consistent with the suggestion that school-based smoking prevention programmes can, over a 12 month period, prevent the uptake of smoking among a statistically significant proportion of adolescents who had not previously smoked. The findings are, however, based on a synthesis of data from five RCTs with high risk of bias and evidence of statistical heterogeneity among trial-level effect estimates.

Limitations

The meta-analysis reported here combines data across studies in order to estimate effect (OR) with more precision than in single study. The main limitation of this meta-analysis is the poor quality of available evidence. All trials were assessed as having high risk of bias, and such trials are strongly associated with inflated effects in favour of the intervention

Existence of variation across interventions and the differences in outcome definitions might influence the estimate of effect.

Several issues limit the applicability of the evidence and the generalizability of findings, Evidence comes almost exclusively from trials in western, industrialised, countries and the extent to which school prevention programmes can be transferred to other cultural contexts is unclear. Intervention content was poorly reported, with limited specification of core components, targets and mechanisms. Additionally, it was not always possible to confidently delineate intervention structure, such as the number, length and frequency of smoking prevention contacts. Data on intervention fidelity, adherence, and acceptability was insufficient in all trials.

The process of conducting the review has some potential for bias. The search was limited from year 2000 to 2010, and it is possible that inclusion of studies published before 2000 may have changed the findings of the review. However, this seems very unlikely, and would tend to favour the intervention, not least because of the limited provision and effect of usual care as the control comparison in studies prior to 2000.

The selection and assessment of trials included in the review was undertaken by one person, which may introduce bias through systematic error. However, although not performed independently, study selection and assessment was monitored and checked for systematic errors. There were no trials included in recent systematic reviews that were not identified during the process of conducting my review.

Existing evidence

Between year 2000 to 2010, six different systematic reviews of school-based smoking prevention programmes were published (Flay, 2009; Dobbin et al., 2008; Park, 2006; Thomas & Perera, 2006; La Torre et al., 2005; Wiehe et al., 2005). Consistent with the

findings of my review, previous reviews have noted the ‘promise’ of school-based programmes, but have also been critical of the poor methodological quality of the available evidence and the lack of evidence on longer-term effects.

My review is the first review, however, to focus exclusively on smoking prevention trials, since other reviews have included trials with components that focussed on smoking cessation, or trials in which smoking was one of several behavioural targets within a broader lifestyle intervention. Similarly, other reviews have not examined intervention effects among younger people who have never smoked, despite being the principal target group for population-level prevention programmes.

Future research would usefully incorporate the following characteristics:

- Cluster randomised design, with published protocol and trial registration;
- Sufficient power to detect, as statistically significant, a small but meaningful difference in smoking prevalence;
- A theory-based intervention with an implementation protocol based on a fully-specified intervention manual;
- Biochemical validation of self-reported smoking abstinence;
- Analysis that takes account of clustering effects and follows the intention to treat principle;
- Concurrent process evaluation to assess the acceptability of the intervention, fidelity of implementation and dissemination potential;
- Adequate reporting of methods, intervention and results in peer-reviewed publication.

Deciding which school-based smoking prevention intervention to implement for my study in Malaysia was not straightforward because 1) there was uncertainty regarding the effectiveness of school-based anti-smoking interventions and 2) most of the existing studies were conducted in industrialised countries and it may not be feasible or practical to implement the potentially effective interventions that were reported in these studies in Malaysia. This encouraged me to return to theoretical insights into adolescent smoking uptake and maintenance. These theoretical insights would enable me to develop a potentially effective school-based anti-smoking intervention that was also potentially feasible to implement within the context of Malaysia.

It has been widely argued that a number of social cognition models explain human behaviour such as smoking uptake among adolescents. One of the most prominent social cognition models is the Theory of Planned Behaviour (TPB) (Ajzen, 1991, 2002). According to the TPB adolescent smoking uptake and maintenance is determined by behavioural intention. Behavioural intention is future intention to either choose to smoke or choose not to smoke. Behavioural intention, in turn, is determined by three proximal variables. These proximal variables are attitudes, subjective norms and perceived behavioural control.

Attitudes refer to the perceived advantages or disadvantages of the consequences of smoking or not smoking. Subjective norms refer to social influences i.e. what the adolescent believes important people such as friends and family think she/he should do in relation to smoking or not smoking. Perceived Behavioural Control refers to an adolescent's perceived ability to act in accordance with her/his smoking-related wishes. In other words how easy or difficult does the adolescent perceive that it would be to not smoke if she/or he wishes.

Factors such as gender, ethnicity and socioeconomic class are external to the model and only exert their influence through the three identified proximal variables. This is an important

consideration in Malaysia given that large gender difference in adolescent smoking prevalence.

A key aspect of the TPB then is subjective norms or social influences. The concept of social influence is a central tenet to a number of prominent school-based anti-smoking interventions including peer supporter/peer educator interventions (Audrey et al., 2004) . School-based peer-led interventions are premised on the notion that students attending school may influence the smoking-related intentions of other students through two routes. First through formal student-led classroom-based activities whereby students take the lead and the class is composed of same-aged peers or younger students. Second, through informal communication between students.

As demonstrated by Harden et al. (2001) in their systematic review, sufficient evidence had been accumulated by the turn of this century to suggest that school-based peer-led interventions may potentially positively affect adolescent smoking. However, Harden et al (2001) drew attention to the variable quality of the studies that they used to develop their conclusion. Subsequently Campbell et al. (2008) conducted a large (n= 11,043) comprehensive cluster randomised control trial of a school-based peer-led anti-smoking intervention among 12-13 year olds in the UK that they termed the ASSIST trial. Campbell et al. (2008) recorded that the intervention significantly and positively influenced adolescent smoking uptake.

Malaysia has a history of implementing school-based peer-led interventions primarily the PROSTAR programme which aimed to positively influence the transmission of HIV among young people living in Malaysia (pROSTAR, 2001. Thus, developing and implementing a school-based peer-led anti-smoking intervention was potentially feasible within the context of Malaysia. Additionally, given the findings of Campbell et al. (2008), the implementation of a

school-based peer-led anti-smoking intervention had the potential to effectively reduce smoking uptake and/or smoking maintenance among Malaysian teenagers.

Conclusions

Evidence on the effectiveness of school-based smoking prevention interventions is insufficient in both quantity and quality. The finding that, for adolescents who had never smoked, smoking prevention programmes were associated with significantly lower smoking prevalence at 12 months should be interpreted with caution in the light of evidence limitations. There thus, remains uncertainty concerning the effectiveness of school-based programmes to prevent smoking uptake among non-smoking adolescents.

CHAPTER 3

METHODS

3.1 Overview

This chapter outlines the methods for evaluating the effects and process of the peer educator intervention. This was a pilot study at a preliminary stage of refining the intervention and evaluation tools for potential use in future randomised control trials (RCT) if positively indicated. The purpose of the pilot is to provide preliminary evidence concerning the effectiveness of the intervention and to explore the acceptability of the intervention. I have divided this chapter into two sections. The first section explains the research governance of the research study. The second section outlines the study design, how schools were recruited to the study, the process of randomization, the delivery of the intervention, the process of data collection and the analyses involved.

SECTION I: RESEARCH GOVERNANCE AND FUNDING

3.2 Research Governance and funding

Ethical approval for this research project was sought and obtained from the Biomedical Research Ethics Committee (BREC) of The University of Warwick. Prior to this application for ethical approval, I sent an application to conduct my research to the Economic Planning Unit of The Prime Minister's Department in Malaysia. The application was approved by the Research Promotion and Co-Ordination Committee on the 2 March 2011(Appendix 3.1)

In addition, I requested and obtained support from the Health Promotion Unit of the Sabah Health Department in order that they would undertake their health promotion activities which constituted usual care in selected schools (Appendix 3.2 and Appendix 3.3). I also successfully applied for funding to the Sabah Health Department to pay for the delivery of

the peer educator training in two regions. This application was possible because I am a member of staff of the Ministry of Health, Malaysia on study leave. I delivered presentations on my research project on three occasions; the first was to the head of the Health Promotion Unit in Sabah, the second was at a technical meeting of Health Promotion Officers in Sabah and the third was a research meeting with the staff of the Sabah Health Promotion Unit, the Non-Communicable Disease Unit and the two regional health offices where I conducted my research. The purpose of these presentations was to outline my research project and to seek support and help to carry out my research especially with regards to data collection and the peer educator training. I was provided a working space in the Health Promotion Unit during the entire duration of my research project. This facilitated contact and correspondence with the Sabah Education Department, schools and relevant agencies.

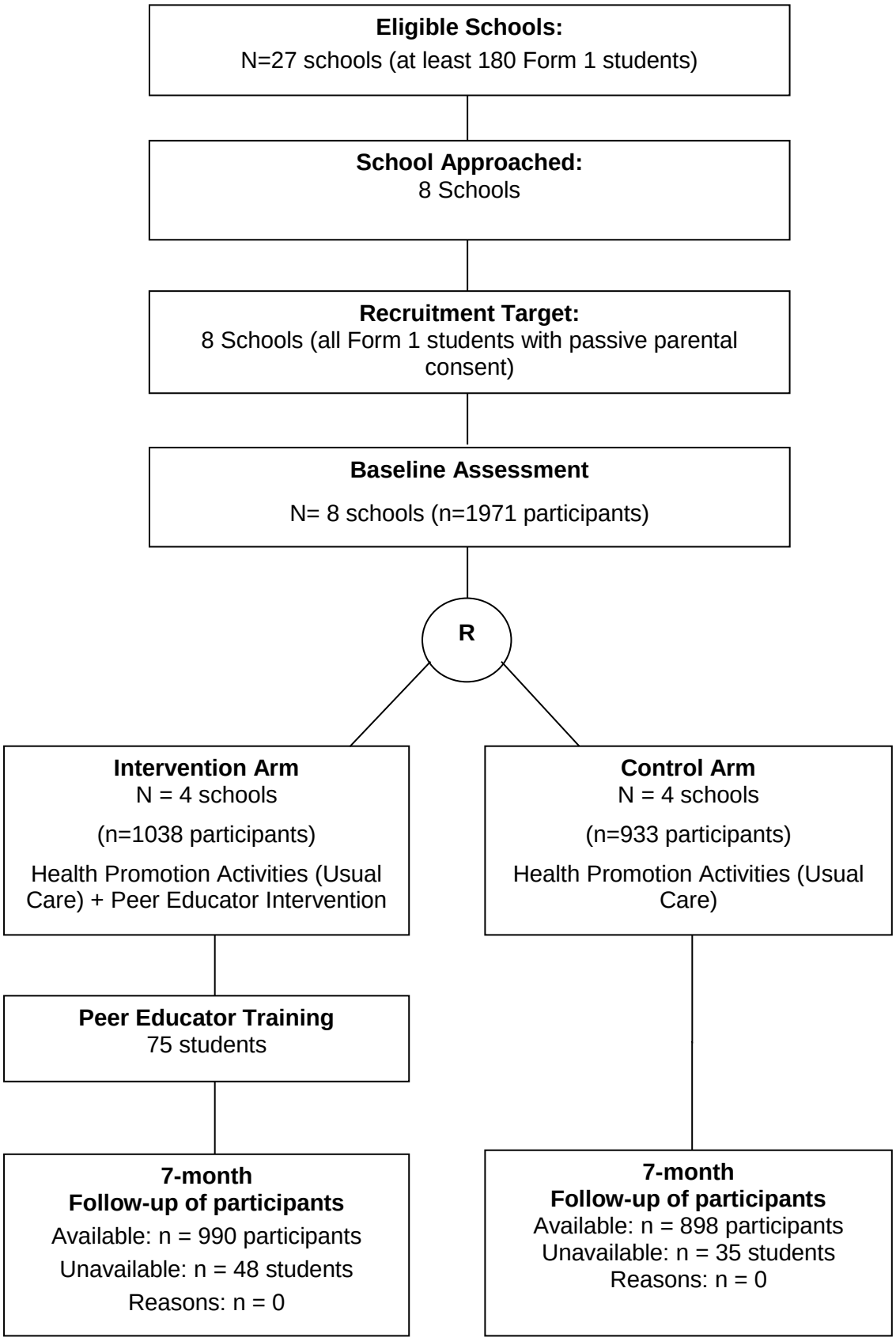
SECTION II: STUDY DESIGN, RECRUITMENT, RANDOMIZATION, ALLOCATION, INTERVENTION, DATA COLLECTION AND ANALYSIS

3.3 Study design

My investigation was a pilot cluster randomized control trial (RCT) of a school-based smoking prevention intervention with embedded process evaluation. It was conducted in public secondary schools in two districts (PKK Kota Kinabalu and PKK Keningau) in the State of Sabah, Malaysia. The selected districts had urban, sub-urban and rural populations. A total of twenty-seven public schools that had a total enrolment of at least 180 Form 1 students were eligible to take part in the study. Eight schools that agreed to participate in the trial were randomly assigned to either the intervention or control arm of the trial. Prior to the randomization of schools, all Form 1 students answered the baseline questionnaire and were subsequently followed-up 7 months after the baseline data collection. The study design is summarized in Figure 3.1.

Figure 3.1

Diagram of study design



3.4 School Recruitment

After obtaining full ethics approval, I applied for approval from the Sabah Education Department to conduct my research project in the State of Sabah *(*Appendix 3.4*).* Once the approval was granted, I contacted eight head teachers from the total of twenty-seven eligible schools to arrange an appointment to discuss the aims of the project and what involvement with the project entailed. All eight schools that I approached agreed to participate in the research project. During the meeting with each head teacher, I provided an invitation letter together with an information sheet and consent form *(*Appendix 3.5*)*. Head teachers who were willing for their school to participate in the research project signed a written permission letter.

3.5 Randomization of schools

The eight schools that agreed to participate in this research project were stratified according to district (PKK Kota Kinabalu and PKK Keningau) and randomly allocated to the intervention and control arms of the study. The process of allocation involved the following steps. As soon as I had recruited a school I contacted my supervisor in the United Kingdom who acted as an independent person and randomly assigned the school to the intervention or control arm using a computer generated random sequence. I had no knowledge of the random allocation sequence and my supervisor had no knowledge of the recruited school other than its name. Thus, the randomization of participating schools into intervention and control schools was concealed.

3.6 Recruitment of Participants

Once the schools were recruited to the research project, I sought passive parental consent. A letter outlining the project together with an information sheet and a parental consent form which stated that the parent did not want her/his child(ren) to participate in the research project (Appendix 3.6) was sent by teachers to the parents/guardians/carers of all Form 1

students via the students themselves. Parents/guardians/carers who did not wish their children to participate in the completion of the research questionnaires, were required to sign and return the parental consent form to the school teacher. I did not receive any signed consent forms from parents that indicated that they objected to their child (ren) participating in my research study.

I chose passive parental consent because the questionnaire was confidential and did not require the students' to attach their names. It was also highly unlikely that any student could be identified from her/his answers. Students could have decided not to participate if they wished at this point. The unit of randomization was the school in this study. Thus, all Form 1 students in selected schools were eligible to complete the questionnaire.

3.7 Allocation of schools

The participating schools were randomly allocated into four control and intervention schools equally according to district. Hence, each district had two control schools and two intervention schools. Intervention schools received the peer educator intervention and usual health promotion activities while control schools received only the usual health promotion activities.

3.7.1 Health Promotion Activities

The health promotion activities that constitute usual care were coordinated and delivered by health promotion staff from the regional health offices of the two selected districts. The aim of the health promotion activities was to facilitate wide scale increased awareness of tobacco and smoking related issues. The health promotion activities included: health talks, health exhibitions and distribution of printed health promotion materials, displays of audio-visual documentaries and launching of 'World no tobacco day'. The printed health promotion materials were produced by the Ministry of Health (Division of Health Education) and the

Sabah Health Department (Health Promotion Unit). The same health promotion team went to all selected schools in each region. I delivered the same slide presentation to the health promotion teams in each region which focussed on guidelines for the contents of health exhibitions and health talks. Generally, the activities were usually conducted in the school hall and open to all students including Form 1 students in selected schools.

3.7.2 Peer educator intervention

The peer educator intervention that I developed was underpinned by the social influence approach. The social influence approach focuses on changes in knowledge, attitudes, perceptions and behaviours as a consequence of interactions with people and the surrounding social environment. The intervention was premised on the notion that peer educators may influence other students at the individual and group level through informal personal group discussions. It was hoped and anticipated that peer educators would share their knowledge, advocate desired behaviour and group norms and act as role models.

3.8 Data collection

The development of appropriate data collection tools was important if the objectives of my research were to be achieved. Baseline and follow-up data collection were conducted in eight schools. Before answering the questionnaire, the researcher explained to the students the purpose of collecting data and stated that their participation in the questionnaire was confidential and voluntary. Students would raise-up their hands at any time if they encountered problems in the questionnaire. Seven months after baseline data collection, the researcher returned to all participating schools to conduct the follow-up data collection.

The main instruments for data collection in this research were the questionnaires for baseline and follow-up data. The baseline and follow-up questionnaires are available (Appendix 3.7; Appendix 3.8).

The baseline and follow-up questionnaires were based primarily on the GYTS questionnaire (2003) (Krishnan, 2003). Some questions were replicated in their entirety. These questions focussed on smoking-related issues and health promotion activities that were delivered by teachers and by health promotion officers. Additional questions were added to the questionnaires. Some additional questions aimed to assess influences that were potentially important in the context of Malaysia. One of these questions asked students where they stayed during term time as students attending Malaysian schools may stay with their families during term time. Alternatively they may stay in a school hostel or they may stay with relatives including, grandparents, aunties, uncles, brothers or sisters.

Other additional questions were related to the TPB. TPB-related questions on attitudes, subjective norms, perceived behavioural control and behavioural intention were developed following the instructions that were outlined in the Centre for Health Services Research Manual, University of Newcastle (Francis et al., 2004) and then translated into Malay. All answer responses to the TPB-related questions were Likert scales with seven categories.

There were three types of attitudes questions; direct measurements of attitudes and two types of indirect measurements of attitudes. Indirect measurements were composed of a set of two related questions. The first question focussed on a behavioural belief. The second question focussed on an outcome evaluation of the behavioural belief. Subjective norms questions were composed of complimentary sets of two questions. The first question focussed on a normative belief and the second question focussed on the motivation to comply with this normative belief. There were three types of perceived behavioural control questions; direct measurements of perceived behavioural control and two types of indirect measurements of perceived behavioural control. Indirect measurements were composed of a set of two related questions. The first question focussed on a control belief and the

second question focussed on the influence of the control belief. Three direct questions were developed to assess smoking behavioural intention.

The final baseline questionnaire was divided into 4 parts; a) participants' socio-demographic characteristics and smoking behaviour of relatives and friends b) smoking status and smoking related experiences c) attitudes and d) smoking prevention activities in school. While in the follow-up questionnaire, participants were asked only their smoking status, smoking related experiences and attitudes. Participants in both questionnaires were matched with their birth date and the first three letters of their mother's name.

The first part of the questionnaire regarding participants' socio-demographic characteristics focussed on gender, ethnicity, place where participants stayed during school term and the highest level of parents' education. In addition, the participant was also asked about the smoking status of each of his/her family members and to estimate the number of his/her family members/relatives and close friends who were smokers. Family members included the participant's father, mother and siblings and relatives included the participant's cousins, uncles, aunties and grandparents.

The second part of the questionnaire focussed on the smoking status of participants and their smoking related experiences. Participants were asked to choose a description of his/her smoking status. In addition participants were also asked whether he/she had smoked in the past 7 days and 30 days. Another two questions that were related to smoking experiences focused on preferred, if any, type of tobacco product and an estimation of the number of cigarettes that the participant had smoked if he/she was a smoker in the past 30 days. The attitudes section of the questionnaire I developed based on a psychological model of behaviour change, the TPB (Ajzen, 1988). The TPB is a social cognition model that purports to explain human behaviour. It predicts that undertaking specific behaviours is

conditional on behavioural intentional. The theory proposes that three variables namely attitudes, subjective norms and perceived behavioural control, in turn, predict a person's intention to perform a behaviour.

The last part of the questionnaire focussed on the smoking prevention activities in each participating school. The reason for including these questions was to determine whether school smoking related activities prior to my research project varied between the intervention and control schools. The smoking prevention activities referred to activities which were conducted by school teachers and health staff.

Additional questions which were asked at follow-up but not at baseline were related to participants' experiences of having had a personal talk about smoking issues and/or group discussions on the disadvantages of smoking with their same-age peers.

3.9 Process Evaluation

A mixed methods process evaluation was conducted in parallel with the main trial that aimed to assess the acceptability of the intervention to the students and the feasibility of the implementation of the intervention. In addition, the process evaluation explored the contextual factors that may have potentially moderated the intervention exposure in relation to both content and intensity.

The peer educator intervention was carried out in the schools in which selected students attended the peer educator training programme. Before the peer educator training began, the students completed a needs assessment form (Appendix 3.9) to identify their needs as peer educators. Peer educators were also required to complete questionnaires on knowledge and attitudes before and after the peer educator training (Appendix 3.10). After the training was completed, the participants were asked to complete an evaluation form so

that I could assess the appropriateness of the training module and programme (Appendix 3.11).

In addition, two sets of focus group discussions with the peer educators were conducted in order to ascertain their understanding, opinions and experiences of the peer educator training and the peer educators' roles. The initial set of focus group discussions (Appendix 3.12) were carried out shortly after the peer educator training had been completed. With the help of two health promotion officers, I managed to conduct four initial focus group discussions with peer educators from each of the four intervention schools. Two focus group discussions were conducted for each peer educator training programme. The second set of focus group discussions (Appendix 3.13) were conducted three months after the peer educator training had been completed. However, I did not receive help to do this and only managed to conduct focus group discussions in three schools. Another source of data that I have drawn upon in this research focused on the log books of peer educators which were collected six months after the peer educator training had been completed.

3.10 Data Analyses

A fully-specified statistical analysis plan was developed to estimate the effect of the intervention in relation to the between-group contrast in smoking behaviour and smoking intention based on all participants within each school, with analysis centred on the following criteria:-

i) The student level for smoking behaviour, using the relative risk and subgroup analysis to compare the smoking behaviour between groups, the chi-square analysis to determine the relationship between smoking behaviour and groups' allocation.

ii) The school level for elements in the TPB, using the independent t-test and paired t-test to compare between group (intervention and control) mean scores of the elements of the TPB.

iii) The student-school interface, using multi-level modelling to identify potentially important interactions between school-level factors and student-level effects on the outcomes of smoking behaviour and smoking intention.

These statistical analyses were carried out using the IBM SPSS (Statistical Package for the Social Sciences) version 21 software.

Descriptive statistical methods were used to describe the findings from the assessment of the peer educator training. The focus group discussions were taped and transcribed. Names of individuals and schools were replaced with personal identification numbers to preserve anonymity. The thematic review of the transcribed data was undertaken manually. A process of analytic induction (Bendassolli 2013) allowed me to compare and contrast the different focus group accounts and build up categories of themes that were directly related to the topic guide components. It also allowed me generate empirically based themes from the data that were obliquely related to the topic guide. Excerpts from these focus group discussions were labelled according to the theme to which they were related and used to provide quotes to illustrate the theme. These quotes have been anonymised.

CHAPTER 4

BACKGROUND AND CHARACTERISTICS OF PARTICIPANTS

4.1 Overview

This chapter describes the background and characteristics of participants in relation to the demographic factors, their smoking behaviours, the smoking status of the people surrounding them and their previous exposures to smoking prevention activities in schools. Most of the above information, I obtained from the quantitative baseline data

4.2 Demographic characteristics of the study participants

Descriptive analysis of study participants' demographic characteristics is important as these characteristics may potentially confounding factors that influence the initiaton of adolescent smoking. As mentioned in Chapter 3, schools in each district were randomly allocated into intervention and control schools so that each district had the same number of intervention and control schools. I have hidden the identity of the schools by giving each school a letter and a number. The intervention schools were given the letter I for intervention (I1, I2, I3 and I4) and the control schools were given the letter C for contol (C1, C2, C3 and C4). The total number of students per school who completed the baseline questionnaire ranged from n=178 to n=363 and the majority of baseline participants (53%) were from intervention schools.

4.2.1 Gender

As shown in the Table 4.1, the baseline sample in this study comprised of n=1971 participants of whom 51.8% were boys and 47.8% were girls. However, one of the participating schools, C2 appeared to be different from the others as more than two thirds of

the baseline participants in C2 were boys (71.4%). According to a senior teacher in C2 there were fewer female students in C2 because a nearby school was an all girls school.

4.2.2 Ethnicity

Table 4.1 also records the ethnicity of the participating students. Approximaately 40% of the total number of participants belonged to the Kadazan/dusun community. Other students belonged to the Bajau community (14.5%), the Malay community (13.4%), the Chinese community (12.9%), the Murut community (8.3%) and other communities (10.8%). The predominant ethnic group varied according to the school. Hence, the major ethnic group in four schools (I2, I3, I4 and C4) was Kadazan/dusun. In two schools (C1 and C2) the major ethnic group was Bajau and in two other schools the major ethnic group was Chinese (I1 and C3). A sizeable proportion of students in two schools (I4 and C4) belonged to the Murut community.

4.2.3 Place to stay during school term

Where students stay during term time is a potentially important environmental factor that may influence the initiation of smoking among adolescents. This environmental factor influences, for example, the availability of cigarettes, proximity of and thus, imitation of older people, regulation of tobacco free space and parental control. Students stay in a variety of places during school term in Malaysia. Students from rural areas or those who have transportation problems getting to school, for example, have the option of staying in a school hostel during school term. Additionally, a small number of students may stay with relatives during school term. The term relatives refers to participant's brothers, sisters, cousins, aunties, uncles and grandparents. In this study, more than 90% of the participants stayed with their parents during school term. However, two schools (I4 and C4) appeared different to the other schools.

4.2.4 Level of parents' education

The education level of parents was categorised into five levels as shown in Table 4.1. However, because of the influence of education-level on job opportunities these five categories could be be reduced to three main categories a) primary b) lower and upper secondary school and c) higher education including college and university education. Having a higher level of education promised a better life due to wider and better paid job opportunities. Relatively few participants had fathers who had not gone to school or were illiterate. However, two schools had a relatively high proportion of participants whose fathers had not gone to school or were illiterate (C1=8.7%; C2=11.5%). More than one third of participants' fathers had completed their upper secondary school. However, the table also shows that fewer than 6% of participants' fathers went on to higher education.

The level of education on participants' mothers showed a similar pattern to that shown in relation to participants' fathers but the proportions were different. Hence, the proportion of partcipants' mothers who were illiterate or had not gone to school was slightly higher (7.0%) than the proportion of partcipants' fathers who were illiterate or had not gone to school (4.7%). The proportion of mothers who were illiterate or had not gone to schools was slightly higher in two schools (C2 and C4) than in other schools. Again the majority of participants' mothers completed their upper secondary school education. However, the proportion of mothers who completed upper secondary school was 4% lower than the proportion of participants' fathers who completed their upper secondary school education. This study also indicated that a relatively large proportion of participants either did not know their parents' education level or they knew their parents' education level but did not want to answer the relevant question.

Table 4.1
Characteristics of Participants

Characteristics	Allocation of schools										Overall n=1971
	Intervention schools n=1038					Control schools n=933					
	I1 n=217	I2 n=363	I3 n=178	I4 n=280	Total n=1038	C1 n=207	C2 n=227	C3 n=248	C4 n=251	Total n=933	
Gender											
Boy	51.6%	49.9%	43.8%	51.1%	49.5%	51.7%	71.4%	49.2%	46.2%	54.3%	51.8%
Girl	48.4%	49.9%	55.6%	48.9%	50.3%	46.4%	28.6%	50.8%	53.4%	45.1%	47.8%
Missing data	-	0.3%	0.6%	-	0.2%	1.9%	-	-	0.4%	0.6%	0.4%
Ethnicity											
Malay	4.1%	14.9%	2.8%	17.1%	11.2%	31.9%	26.9%	4.4%	4.0%	15.9%	13.4%
Kadazandusun	25.3%	55.1%	88.2%	45.7%	52.0%	5.3%	13.2%	18.5%	64.9%	26.8%	40.1%
Bajau	3.2%	11.0%	1.1%	5.7%	6.3%	47.3%	50.7%	1.2%	1.6%	23.6%	14.5%
Chinese	53.9%	3.9%	0.6%	3.9%	13.8%	0.5%	-	44.4%	-	11.9%	12.9%
Murut	0.5%	2.8%	4.5%	20.7%	7.4%	0.5%	1.8%	4.8%	27.9%	9.3%	8.3%
Others	12.9%	12.4%	2.8%	6.8%	9.3%	14.5%	7.5%	26.6%	1.6%	12.5%	10.8%
Place to stay during school term											
Parents	93.1%	91.5%	93.3%	71.8%	86.8%	92.3%	82.8%	95.2%	68.1%	84.2%	85.6%
Relatives	5.9%	6.3%	3.9%	8.2%	6.4%	5.3%	6.6%	4.4%	6.0%	5.7%	6.0%
School hostel	0.5%	0.3%	0.6%	16.4%	4.7%	-	7.9%	0.4%	23.1%	8.1%	6.3%
Others	0.5%	1.9%	2.2%	3.2%	2.1%	2.4%	2.6%	0.4%	2.8%	2.0%	2.1%

	Allocation of schools										
	Intervention schools n=1038					Control schools n=933					
	I1 n=217	I2 n=363	I3 n=178	I4 n=280	Total n=1038	C1 n=207	C2 n=227	C3 n=248	C4 n=251	Total n=933	Overall n=1971
Parents' education											
a) Father:											
Never go to school	2.8%	3.0%	2.8%	3.2%	3.0%	8.7%	11.5%	3.6%	3.6%	6.7%	4.7%
Primary school	8.8%	23.7%	18.5%	30.4%	21.5%	21.3%	27.3%	16.5%	31.9%	24.3%	22.8%
Lower secondary school	13.4%	11.0%	21.9%	17.9%	15.2%	12.6%	6.6%	10.5%	11.6%	10.3%	12.9%
Upper secondary school	49.7%	45.5%	38.8%	30.0%	41.0%	32.8%	37.4%	51.2%	33.5%	39.0%	40.1%
College/universities	6.5%	3.9%	3.9%	6.1%	5.0%	3.4%	7.9%	11.7%	2.8%	6.5%	5.7%
don't know	18.9%	12.9%	14.0%	12.5%	14.3%	21.3%	9.3%	6.5%	16.7%	13.2%	13.7%
b) Mother:											
Never go to school	2.8%	7.4%	7.9%	6.8%	6.4%	6.3%	11.5%	3.6%	9.2%	7.6%	7.0%
Primary school	12.9%	22.6%	26.4%	28.6%	22.8%	24.6%	30.4%	13.3%	37.5%	26.5%	24.6%
Lower secondary school	15.2%	13.8%	20.8%	15.4%	15.7%	13.0%	8.8%	12.5%	9.2%	10.8%	13.4%
Upper secondary school	46.1%	40.2%	30.3%	28.9%	36.7%	32.3%	33.5%	53.7%	25.9%	36.5%	36.7%
Colleges/universities	5.5%	3.3%	3.4%	5.7%	4.4%	2.9%	6.6%	10.9%	1.2%	5.5%	4.9%
don't know	17.5%	12.7%	11.2%	14.6%	14.0%	20.8%	9.3%	6.0%	17.1%	13.1%	13.5%

4.3 Baseline results

As stated in Chapter 3, all Form 1 students in participating schools were invited to participate in the study and no parent withdrew his/her parental consent which would have prevented his/her son or daughter from participating in the study. At baseline, the total number of students who completed the questionnaire was 1971.

4.3.1 Response rate

The overall total number of Form 1 students from all schools participating in the study was 2118. This figure is based on the registration record of Form 1 students in 2011. Thus, the response rate of participants at baseline was very good (93.1%). The response rate in the control schools (93.7%) was better than the response rate in the intervention schools (92.5%). Students who did not complete the baseline questionnaire were either absent or refused to participate.

4.3.2 Smoking behaviour and tobacco use

Table 4.2 shows the smoking behaviour of participants at baseline and types of tobacco used. The baseline results indicate that over 90% of participants in this study were never smokers. I enquired about participants' smoking behaviours during the past 7 days and 30 days because I wanted to compare my study with other studies that reported the prevalence of adolescent smoking particularly among adolescents in Malaysia. As stated in Chapter 2, in Malaysia, current smoking among adolescents is defined as smoking at least one day in the 30 days preceding the questionnaire (Public Health Institute, 2006). Other countries such as the United Kingdom define current smoking among adolescents as regularly smoking at least one cigarette a week (Bewley et al., 1973).

The prevalence of smoking during the previous 7 days was higher in the intervention schools than in the control schools. At baseline, the proportion of participants who smoked during the past 7 days was 4.3% whereas 10% of study participants smoked during the past 30 days.

The proportion of current smokers in both the intervention and control schools was similar.This proportion was within the range of estimated current smoking prevalence between 2.4% and 29.7% for adolescents aged below 18 years in Malaysia as reported in other studies and discussed in Chapter 2. The majority of participants who smoked in the past 30 days, consumed 1-4 cigarettes. The main type of tobacco used by participants who smoked was cigarettes. A small portion about 2% of the total participants also used the traditional type of tobacco called 'kirai/sigup'. The 'kirai/sigup' is made up of dried tobacco leaf that is rolled in nipa palm leaf.

Table 4.2
Smoking behaviours and tobacco used

Smoking behaviours	Intervention Schools n=1038	Control Schools n=933	Total N=1971
i) Smoking in 7 days			
Yes	4.7%	3.8%	4.3%
No	94.3%	96.0%	95.3%
Did not answer	1.0%	0.2%	0.4%
ii) **Smoking in 30 days**			
Yes	10.1%	10.3%	10.2%
No	89.4%	89.5%	89.4%
Did not answer	0.5%	0.2%	0.4%
iii) Quantity of cigarette consumed in the past 30 days			
Not smoker	89.2%	89.3%	89.2%
1-4 cigarettes	7.2%	8.4%	7.8%
5-10 cigarettes	1.2%	1.4%	1.3%
11-20 cigarettes	0.5%	0.2%	0.4%
More than 20 cigarettes	1.5%	0.6%	1.1%
Did not answer	0.4%	0.1%	0.3%
iv) Tobacco product			
Did not consumed any tobacco products	87.3%	88.2%	87.7%
Only smoked cigarette	9.6%	9.6%	9.6%
Kirai/sigup	2.5%	1.3%	1.9%
Others	0.6%	0.9%	0.7%

4.3.3 Smoking status of family members

Table 4.3 describes the smoking status of family members of the participants. Almost half of the total number of participants had fathers who smoked. This result is comparable with the findings of the National Health and Morbidity Survey in 2006 where 46.4% of adult Malaysian males were smokers (Public Health Institute, 2006). However, more than 90% of participants' mothers were non-smokers. Nearly a quarter of participants (23%) reported having siblings who smoked. The percentage of participants who had parents who smoked was commonly higher in the intervention schools than in the control schools. However, the proportion of participants who had siblings who smoked was higher in the control schools than in the intervention schools.

Table 4.3

Smoking status of parents and siblings

Smoking status	Intervention Schools n=1038	Control Schools n=933	Total N=1971
i) Smoking status of father			
Non-smoker	49.8%	51.4%	50.6%
Smoker	49.8%	47.1%	48.5%
Did not answer	0.4%	1.5%	0.9%
ii) Smoking status of mother			
Non-smoker	94.2%	93.9%	94.1%
Smoker	3.8%	2.9%	3.3%
Did not answer	2.0%	3.2%	2.6%
iii) Smoking status of siblings			
Non-smoker	69.6%	67.3%	68.5%
Smoker	22.4%	23.9%	23.1%
Did not answer	8.0%	8.8%	8.4%

4.3.4 Smoking status of relatives and friends

Table 4.4 shows the smoking related behaviour of participants' relatives and friends. Relatives in this context refers to participants' cousins, uncles, aunties and grandparents.The vast majority of participants had some relatives who smoked. In addition, approximately 9% of participants said most of their relatives smoked. However, there was a relativley large

proportion of participants who were not sure of the smoking status of their relatives. The proportion of participants who had relatives who smoked was greater in the control schools than in the intervention schools.

Approximately 40% of the participants recounted that none of their friends smoked. The percentage of participants who reported that some of their friends were smokers was 20%. Additionally, approximately 5% of participants responded that most of their friends were smokers. However, more than one third of the participants stated that they were not sure if their friends were smokers or not. The smoking behaviour of the participants' friends was similar in the intervention and control schools.

Table 4.4

Smoking behaviour of relatives and friends

Smoking background of relatives and friends	Intervention Schools n=1038	Control Schools n=933	Total N=1971
i) Having relatives who smoke			
None	11.2%	8.8%	10.1%
Some	42.0%	48.3%	45.0%
Most	8.7%	8.9%	8.8%
All	0.4%	0.4%	0.4%
Not sure	37.7%	33.6%	35.7%
ii) **Having friends who smoke**			
None	39.6%	39.5%	39.6%
Some	20.0%	20.5%	20.2%
Most	5.4%	5.3%	5.3%
All	1.3%	1.4%	1.3%
Not sure	33.7%	33.3%	33.5%

4.3.5 Smoking prevention in school by teachers

Table 4.5 describes some of the smoking prevention activitites of teachers in schools. More than 70% of particpants indicated that they were taught by their teachers in schools about the dangers and effects of smoking. However, less than half of the participants had discussed with

their teachers the reasons why adolescents smoke. The majority of participants had discussions with their teachers about smoking issues when they were in primary schools.

Table 4.5

Smoking prevention in school by teachers

Smoking prevention in school	Intervention Schools n=1038	Control Schools n=933	Total N=1971
i) Taught about the danger of smoking			
Yes	80%	83%	82%
No	20%	17%	18%
ii) Discussed the reason of smoking among adolescents			
Yes	49%	43%	46%
No	51%	57%	54%
iii) Taught the effects of smoking			
Yes	74%	75%	75%
No	26%	25%	25%
iv) Last time discussion was held between student and teacher about smoking			
Never	28%	23%	26%
This semester (this year)	10%	8%	9%
Last semester (previous year)	25%	26%	26%
More than a year	37%	43%	40%

4.3.6 Smoking prevention activities by health staff

Table 4.6 shows the health promotion smoking prevention activities that were delivered by health staff in school. More than half of the participants from both the intervention and control schools had attended anti-smoking programmes which were organized by health staff such as smoke free campaigns and the launching of the World No Tobacco Day. Additionally, more than 80% of participants had attended a health talk about the dangers of smoking that was presented by health staff. Furthermore, more than 85% of participants recounted having seen health promotion printed materials such as posters and pamphlets that highlighted the dangers of smoking.

Table 4.6

Smoking prevention activities by health staff

Smoking prevention activities	Intervention Schools n=1038	Control Schools n=933	Total N=1971
i) Ever attended anti-smoking programme organised by health staff			
Yes	51%	56%	53%
No	49%	44%	47%
ii) **Ever attended health talks on danger of smoking by health staff**			
Yes	81%	85%	83%
No	19%	15%	17%
iii) Ever saw posters on danger of smoking			
Yes	93%	94%	94%
No	7%	6%	6%
iv) Ever read pamphlets about danger of smoking			
Yes	84%	90%	87%
No	16%	10%	13%

4.4 Attrition rate

A total of 1888 participants completed the follow-up questionnaire which was administered seven months after the baseline questionniare. Table 4.7 shows the attrition rate of participants at follow-up. Attrition rate is the proportion of missing participants at follow-up. Overall, the attrition rate for participants at seven months follow-up was small (4.2%). However, the attrition rate of participants was sllightly higher in the intervention schools (4.6%) than in the control schools (3.8%).

Table 4.7
Attrition rate at follow-up

Participants	Baseline	Follow-up	Attrition rate
Intervention schools	1038	990	4.6%
Control schools	933	898	3.8%
Overall	1971	1888	4.2%

CHAPTER 5

PROCESS IMPLEMENTATION AND EVALUATION OF THE PEER EDUCATOR INTERVENTION

5.1 Overview

This chapter outlines the process I adopted to evaluate the implementation of the peer educator intervention. Evaluation is defined as assessing the value of something (Brophy S et al., 2008). Effective programme evaluation is important to improve and account for public health action by ensuring procedures that are used in public health actions are useful, feasible, ethical and accurate (CDC Report, 1999). First I describe the development of the peer educator module and the outline the module. I then go on to discuss the implementation of the peer educator training programme and then I discuss the process evaluation. The process evaluation I adopted focuses on an assessment of the needs of the students who were selected to be peer educators, an evaluation of the peer educator training from the students' point of view, an evaluation of the implementation of the peer educator intervention in schools and an evaluation of the feasibility and acceptability of the peer educator intervention from the students' viewpoints.

Data on the peer educator training module was assessed via questionnaires and focus group discussions. The questionnaires were administered to the students shortly after the training was completed and focussed on 1) the delivery of the sessions 2) participants' attitudes and feelings towards the training programme and 3) participants' views on the management of the peer educator training. The focus group discussions were held immediately after the peer educator training.

The first set of focus group discussions aimed to ascertain participants' initial opinions and views about the role of peer educators and the peer education training programme before they

started to carry out their roles as peer educators. I conducted four focus group discussions with the help of health promotion officers shortly after each peer educator training programme ended. Eight boys and eight girls were selected at random in each district to participate in single gender focus groups. Thus, a total of thirty two participants took part in the four focus group discussions. The discussions were conducted in the national language of Malaysia, the Malay language and recorded with a tape recorder. I then transcribed and translated all the discussions into English before I identified the common themes from the students' responses, checked for redundancy and chose quotes that were related to the themes.

Student's knowledge and attitudes towards smoking related issues were assessed before and after the peer educator training using a questionnaire.

The second set of focus group discussions were conducted approximately three months after the participants had undergone the peer educator training. The aim of these discussions was to explore the students' experiences of carrying out their roles as peer educators. I went to the three participating schools to conduct the focus group discussions; one focus group for each school. Those selected peer educators who attended school on that day I wanted to run the focus group discussion were invited to participate in the discussion. Twenty seven participants took part in these discussions; fifteen boys and twelve girls. The discussions were again conducted in the Malay Language, recorded with a voice recorder, transcribed, translated and common themes were again identified. The compilation process followed similar steps as in the first focus group discussion.

5.2 Development of the peer educator module

I developed the peer educator smoking prevention module by modifying existing modules. My modified module drew upon existing approaches including YPEER (UN interagency Group on Young Peoples, 2003), IPPF/WHR Tools (International Planned Parenthood Federation, 2004), life skills manual (Peace Corps, 2001) and the PROSTAR module. The YPEER was

underpinned by recognised and well regarded theoretical frameworks (see Appendix 5.2). The aims of my peer educator training module were to facilitate 1) increased awareness and knowledge of smoking related issues and 2) the development of non-judgmental attitudes, self-confidence and communication skills. The contents of the training programme were delivered through a variety of pedagogic practices including lectures, role-plays, presentations, group discussions, group work, self-reflection, video shows, and games. Before the peer educator training, I briefed and trained eleven members of staff from various local health agencies on how to use the peer educator training manual so that they could become facilitators during the peer educators training. The selected health staff were familiar with my approach as they had previously trained as facilitators on the PROSTAR programme.

The peer educator training manual for smoking prevention was divided into seven sessions:-

I) **First session 1: Ice breaker**

In this session, I explained the purpose of the training programme, outlined the sessions and activities and introduced the training programme facilitators. Participants were then given a card tied with raffia knot on which they wrote their names and sketched their own face. This card then became their name tag. Most participants already knew each other as all the peer educators in each region came from one of two intervention schools. By way of formal introduction, participants were asked in turn to stand in front of their peers and introduce themselves. This activity aimed to help the participants overcome shyness and nervousness and become more confident.

Following the introductions, the participants were divided into mixed gender groups of six or seven and the facilitator gave each group a number of points to begin with. The aim of the points was to boost group motivation. Participants assigned their group a name that had to have a meaning and was based on the first letter of the names of group members. If the group needed other letters to complete their group name, they were required to buy them by deducting points from their initial points total. In addition, the group members created a group

logo and a group slogan to support the meaning of their group name. Next, the group members discussed the rationale of their group name and the group's slogan or song. Finally a representative from each small group presented their work in front of the whole group and the facilitator assessed their presentations and creativity and provided feedback to each group.

II) **Second session: Peer educators**

This session aimed to outline the role of a peer educator. Participants were asked to list the positive and negative things they had learned from the people around them. Then, each group discussed their potential to influence their class mates in positive ways. In addition, they were also told about ways to help and support their school friends in times of need. It was hoped that this session would help the participants to become more aware of their potential to influence the people around them especially their friends and family.

III) **Third session: Communication.**

The facilitator explained in a lecture, the basic communication process, the important elements of communication and tips on how to be a good listener. This was followed by a game called 'Whisper! Whisper!'. The facilitator asked the participants to line up in groups. Then the first participant of each group was asked to step forward and taken to a separate area where each of them randomly picked a prepared short message. After 10 minutes, the first participant whispered the short message into the ear of the next member of his/her group and this continued until the last member. At the same time facilitators made some noises to distract the whispering process. Finally, the facilitator asked the last participant to reveal the final message he/she got. In this activity, the participants learned about obstacles in the process of communicating and ways to overcome it. This session ended with a practical activity with pairs of participants that focused on starting conversations in a variety of scenarios.

IV) **Fourth session: Smart without Tobacco**

This session aimed to prevent adolescents from starting cigarette smoking through the provision of facts about tobacco, the use of tobacco in Malaysia and worldwide, smoking related diseases and the impact of smoking. After the lecture on 'Smart without Tobacco', the facilitator played a video that showed an experiment in which cigarettes were boiled in order to identify their contents. This was followed by small group discussions on the effects of smoking and benefits of not smoking. At the end of this session, representatives from each small group presented their work in front of the whole group.

V) **Fifth session: Upholding healthy living**

This session aimed to encourage participants to stay healthy especially by not smoking. The first activity was a role-play about overcoming peer pressure. The facilitator explained and gave ten tips (Appendix 5.3) on how to overcome peer pressure. Then each group was given a scenario in which the participants played their roles in order to recognize and practice ways to overcome peer pressure.

The next activity was to identify risk perception. The facilitator prepared five popular perceptions (Table 5.1) associated with smoking related behaviours. Participants discussed these perceptions and made a small group decision as to whether or not they 'strongly agreed', 'agreed', 'disagreed' or 'strongly disagreed' with these perceptions and stated their reasons for their decisions. This activity helped participants to identify risk perceptions based on facts and reasons.

Table 5.1
Popular perception related to smoking behaviour

1.	Smoking is a mature symbol
2.	You will get friends easily if you smoke.
3.	Smoking is an inspiration source
4.	You look handsome/trendy if you smoke
5.	Smoking can keep you slim

The last activity required participants to commit to non-smoking and recognise the differences between the avoidable and unavoidable risks. The facilitator gave a list of situations (Table 5.2) to each small group and each small group was asked to discuss and decide whether the identified situations were ‘high risk’, ‘risky’, ‘low risk’ or ‘no risk’ in relation to smoking initiation. Adolescents might be exposed to similar situations in their daily life and this session encouraged them to make the right decisions and to remain never smokers or to stop smoking.

Table 5.2
Making decisions in situations

Situation:
1. Having siblings who smoke
2. Having an icon (role model) who smokes
3. Having a handsome/pretty face
4. Always hang out after coming back from school.
5. Attending a festival event
6. Not having a firm stand on certain things
7. Not liking school
8. Having a best friend who was a smoker
9. Liking the cinema
10. Having parents who were smokers
11. Having a desire to be a famous person
12. Actively participating in sports
13. Having a fat body
14. A liking for visiting night clubs.
15. A liking for following the action in films
16. Visiting attractive places
17. Having a lot of friends
18. Having manufactured goods with cigarette producer brand names
19. Becoming aggressive if they were challenged
20. Helping friends in need
21. Not knowing how to manage stress
22. Having a boyfriend/girlfriend who smoked
23. Being weak and lacking self-control
24. Being poor
25. Having a weak academic achievement record

VI) **Sixth session: Issues related to smoking**

The aims of the second last session of the peer educator training were to create acceptable peer educator group norms and enable the participants to understand and support each other in undertaking their roles as peer educators in school or outside from school. This session also aimed to help participants to appreciate their loved ones and reflect on the sacrifices their

loved ones had made for them. All the activities supporting these aims involved games and simulation.

The first activity was 'listen and choose'. The facilitator prepared three cards "agree', 'not agree' and 'not sure' and put the 'agree' card on the right hand side of the room, 'not agree' card on the left hand side and 'not sure' card in the middle. She/he then read out the statements below (Table 5.3) and the participants went to the space which stated their answer. This activity helped participants to identify and explore their attitudes and values with regards to smoking related issues.

Table 5.3
'Listen and choose' activity

Statements:

1. I don't mind if I have a boyfriend/girlfriend who smokes
2. I will remain friends with him/her even though he/she always offers me cigarettes
3. I will still admire my idol even though he/she is a smoker and has been linked to drug-use.
4. I will still use things even though they have cigarette producer brand names on them
5. I will still attend an event even though it is sponsored by a cigarette producer.
6. I don't mind if my parents smoke even though they are short of money
7. It is hard to reject the offer of cigarette from a close friend
8. Smoking could make a person look handsome/trendy
9. Smoking does not negatively affect adolescents
10. I have thought that I will start smoking when I grow-up
11. Smoking could help to stay slim/to reduce weight
12. I don't mind the smell of cigarettes

The next activity was entitled 'Drifting in the deep sea'. The facilitator asked participants to imagine that their small group was boarding a ship and drifting to an unknown location in the deep sea. The ship was on fire and was going to sink but it had a life boat and paddles that the participants could use. The participants were asked to arrange the items listed below (Table 5.4) from 1 to 15 according to their needs and priorities in an effort to save themselves. This activity helped participants to express their values and priorities in life and also to share these values and priorities with others.

Table 5.4
'Drifting in the deep sea' activity

List of Items:
1. A box containing food supplies belonging to the army
2. Chocolate (2 boxes)
3. Container containing five gallons of water
4. Fishing rod/line
5. Life buoys
6. Map of the Pacific Ocean
7. Mosquito net
8. Nylon string (15 feet)
9. Plastic canvas 10 feet long and 10 feet wide
10. Rum 1 quart
11. Sextant (Navigator instrument)
12. Sun glasses
13. Shark repellent
14. Transistor radio
15. Two-gallon tank containing a mixture of kerosene and petrol

The third activity was 'Begin a new life in the new world'. In this activity, the participants learned the importance of specific roles in shaping the community around them. The facilitator read out the case scenario which was based on the destruction of the world as a consequence of nuclear war. There was only one rocket available to carry four passengers to a new world. Only six people were still alive; an injured army officer (or soldier say which), a lawyer, a preacher, a pregnant woman, a scientist and a teacher. The facilitator called one representative from each small group and asked him/her to sit in a circle. Each of them was given a role. Then they discussed and argued about their roles and contributions to the community and their right to be saved.

The last activity was a reflection on life destiny. This activity required participants to think and reflect on their feelings for their loved ones. All participants were required to sit in a big circle and each of them was given a paper and pencil. The facilitator asked them to list the names of 5 to 7 of their loved ones. Then, participants were asked to close their eyes and to visualize and reflect on each of their loved ones and think about their sacrifices, deeds, love, wishes and so on. At the same time, slow music was played and the facilitator read out an emotional poem about the sacrifices made by parents in a child's life. This activity aimed to help

participants to understand and become aware of their responsibilities to their families. It also helped to remind the participants that their families loved them.

VII) **Seventh session: Planning and leadership**

The last session of the peer educator training was planning and leadership. In the process of planning their roles as peer educators, participants were expected to learn to make decisions. The facilitator gave each small group a scenario of a situation which they were asked to discuss and list the steps that were made in coming to a decision. Then, each small group presented their decisions and explained the steps they had taken to reach their decision. The facilitator gave alternative tips in making appropriate decisions outlining in the process some important factors in decision making.

Next, the facilitator described the importance of having goals in everything they did in their lives. Participants practised writing down their short term goals in relation to their roles as peer educators. As a source of motivation, the facilitator played a documentary video about a disabled person who had no hands and legs but was able to perform many things that an able bodied person was able to do. After the video show, the facilitator explained the importance of having a commitment to achieving goals. The facilitator asked the participants to think about and then write their affirmation regarding their roles as peer educators.

The final activity focussed on explaining to the participants the importance of recording their activities in a log book. The facilitator described the terms and ways to record activities in the log book. A sample log book sheet was distributed to each participant. The facilitator read out a scenario containing a number of activities and the participants practised appropriately writing up the activities on the log book sheet. This process continued until the participants understood the terms and the correct ways to record their activities.

5.3 Implementation of Peer Educator Training

The process of implementing the peer educator training involved selecting the participants, selecting the training location, organising sufficient trainers and ensuring that the training could be delivered within the financial budget.

5.3.1 Selecting participants for the peer educator training

The head teachers authorised the counselling teachers in each selected intervention school to work with me on implementing the peer educator intervention. I met each counselling teacher and explained the aims of my research project, the peer educator intervention and the process for selecting peer educators. I asked each counselling teachers to select twenty students to be peer educators in her/his school. Potential peer educators were to be selected by their same aged peers on the basis of who the Form 1 students respected, felt comfortable talking with and believed had leadership qualities. Students in each school who received the most nominations by their peers were eligible to be considered for selection as a peer educator. The counselling teacher in each intervention school was asked to make the final decision regarding peer educator selection based on her/his views, recommendations from the class teachers and the results from the students' polls. The selection criteria to be a peer educator were that selected students should be able to communicate, should be interested in helping their friends, should have an acceptable personality and leadership qualities and had obtained parental consent. If selected students smoked cigarettes, they were only eligible to be a peer educator if they agreed to stop smoking.

The process of selection I had outlined to the counselling teachers was not implemented in any school. I became aware of this in the focus group discussions. In some schools students were asked to complete a form if they were interested in becoming a peer educator, and were then subsequently interviewed by their counselling teachers. The counselling teachers selected students to be peer educators following these interviews. In other schools the counselling teachers interviewed students and asked them during the interview if they wanted

to be peer educators. The counselling teachers in these schools selected students to be peer educators following these interviews.

Students who were selected to be peer educators were required to attend a peer educator training programme. After receiving a name list of participants from the counselling teacher, I sought active parental permission. I sent an information sheet about the peer educator training programme with a parental consent form to the peer educators' parents via the participants themselves. Parents were required to sign and return a parental consent form to attend the training. I gave notification to the parents about the training dates and venue for the peer educator training, two weeks before the training commenced. Initially, I planned to train eighty peer educators which were equally distributed across schools; twenty participants for each school. However, only a total of 73 participants attended and completed the three days and two nights training.

5.3.2 Peer educator characteristics

Table 5.5 shows the characteristics of the selected peer educators. Slightly more students were recruited to the training programme in the District of Keningau (n=38) than in the District of K Kinabalu (n=35) and slightly more boys (n=38) were recruited than girls (n=35). The same number of students were recruited in each of the intervention schools in the District of Keningau (n=19). However, in the District of K Kinabalu nearly twice as many students (n=23) were recruited in I4 than in I3 (n=12).

Table 5.5
Peer educator characteristics

Peer Educator	Number of participants		Total Participants
	District of Keningau	District of K Kinabalu	
Attended and completed the Peer Educator Training	38	35	73
Gender			
• Boy	19	19	38
• Girl	19	16	35
School			
• I1	-	12	12
• I2	-	23	23
• I3	19	-	19
• I4	19	-	19

5.3.3 Participants' reactions when selected as peer educators

In the focus group discussions immediately after the peer educator training was completed I asked the students in each group what their reactions were when the counselling teacher informed them that they had been selected to be peer educators. Most of the students said that they were happy, proud, excited and agreed immediately. Many reported that they were surprised and shocked because they had only been in their new school for about six months.

- *I agreed instantly to be a peer educator when the counseling teacher asked me to be a peer educator (Chun, boy, KK, IS1)*
- *It was a surprise but I was proud and happy.'(Wan, boy, KK, IS2)*
- *I was excited, never expected to be chosen. I wanted to know in detail about smoking. Most of my family members smoke (Mat, boy, KK, IS2)*
- *At first I was shocked, I'm only a Form 1 student and this is my first time to be chosen as peer educator (Rafi, boy, Keningau, IS4)*
- *I'm proud to be chosen…. (Shida, girl, Keningau, IS4)*
- *I was shocked, the counselling teacher called and asked me a few questions, after that she asked me whether I wanted to be a peer educator or not, helping friends not to start smoking. I agreed…. (Ain, girl, Keningau, IS4)*

A few students accepted the invitation to be a peer educator, even though they were anxious and worried. However, these students said that after attending the peer educator training course their anxiety and concern abated and they were relieved.

- *Firstly when I heard that I was chosen to be a peer educator this year, I was a bit worried but after the peer educator training, my anxiety reduced (Fio, boy, Keningau, IS3)*

- *I was happy and at the same time anxious and worried. Even though we're new students to this school.. only 6 months, the counseling teacher chose us to be peer educators, of course I instantly I agreed, it is not easy to get this opportunity (Elly, girl, Keningau, IS3)*

5.3.4 Selecting the location for the peer educator training

One peer educator training programme was conducted in each participating district. With the help from the health promotion officers in each district, I managed to book and use the district sports complex which provides training facilities and accommodation. The sports complex was administered by the state government agency, the Department of Youth and Sport. During the peer educator training, students stayed in a hostel that was part of the selected sports complexes. The accommodation facility for boys was separated from the accommodation facility for girls. Both facilities were properly guarded to ensure the safety of occupants. The health promotion officers also helped to arrange the transportation to take the students from schools to the training venue.

5.3.5 Manpower and resources for the peer educator training

Before the peer educator training, I briefed and trained eleven members of staff from health agencies on how to facilitate the peer educator training module. Most of the health staff were familiar with and had trained as facilitators in the PROSTAR programme, a healthy lifestyle empowerment programme for adolescents in Malaysia. The Health Promotion Unit from the state health department and regional health offices provided photocopying and printing facilities and the necessary supporting equipment such as a sound system and electronic visual display (LCD). The counselling teachers, who accompanied the student participants, also helped to facilitate the group work and discussions. At the end of the training, all the

participants and facilitators including teachers received a certificate of attendance and appreciation signed by the Director of Sabah State Health Department.

5.3.6 Costs of delivering the peer educator training

As an employee of the Ministry of Health Malaysia, I officially asked for financial support from the health promotion unit and the non-communicable disease unit (NCD) of the state health department to pay for the costs of running the peer educator training programme. The direct costs for the running of the peer educator training were related to accommodation, food, venue rental, stationery and supplies and banner/backdrop. Table 5.6 shows the costs of the peer educator training for three days and 2 nights in two districts for 73 participants and 19 facilitators/teachers. The overall total cost was MYR (Malaysian Ringgit) 13,282.10 or £2656.40 at current rate of MYR5 for £1. The preparation of catered food was the largest contributor to the overall total cost.

Table 5.6
Costs of delivery the peer educator training

Item	Cost	Overall cost
Accommodation (2 nights & 3 days) • District of Kota Kinabalu • District of Keningau	 MYR 1831.20 MYR 1058.40	 MYR 2889.60
Food • District of Kota Kinabalu • District of Keningau	MYR 3480.00 MYR 2520.00	MYR 6000.00
Hire for training venue • District of Kota Kinabalu • District of Keningau	MYR 892.50 -	MYR 892.50
Stationery and supplies (including t-shirt)	MYR 2900.00	MYR 2900.00
Banner/backdrop	MYR 600.00	MYR 600.00
TOTAL BUDGET		MYR 13,282.10 (£2,656.40)

Table 5.7 gives the average cost of the programme per school and per participant. The average cost per school was MYR 3320 (£664) and per participant was MYR 182 (£36).

Table 5.7
Analysis of estimated costs of the peer educator training programme

	Average cost
Cost per school (4 schools)	**MYR 3320 (£664)**
Cost per participant (73 participants)	**MYR 182 (£36)**
Cost per person involved in the training (92 people: including 19 facilitators)	**MYR 144 (£29)**

5.4 Needs assessment

A needs assessment was conducted using a questionnaire that was administered to students who were selected to be peer educators. The aims of this assessment were to improve the quality of the peer educator training and to facilitate the implementation of the intervention. A total of 75 students from the four intervention schools responded to the need assessment questionnaire. Students answered the questions by ticking the answers they thought were most appropriate.

Figure 5.1 shows the elements that the students thought were needed in order for them to undertake their roles as peer educators in schools. Most students believed motivation and knowledge were the most important elements. The majority of students also requested training on how to carry out their roles as peer educators and believed they needed guidance from a school teacher on how to carry out their roles and activities as peer educators. Fewer than half the students reported that they would need supervision, recognition and reward.

Figure 5.1
Elements needed by participants to play their roles as peer educators

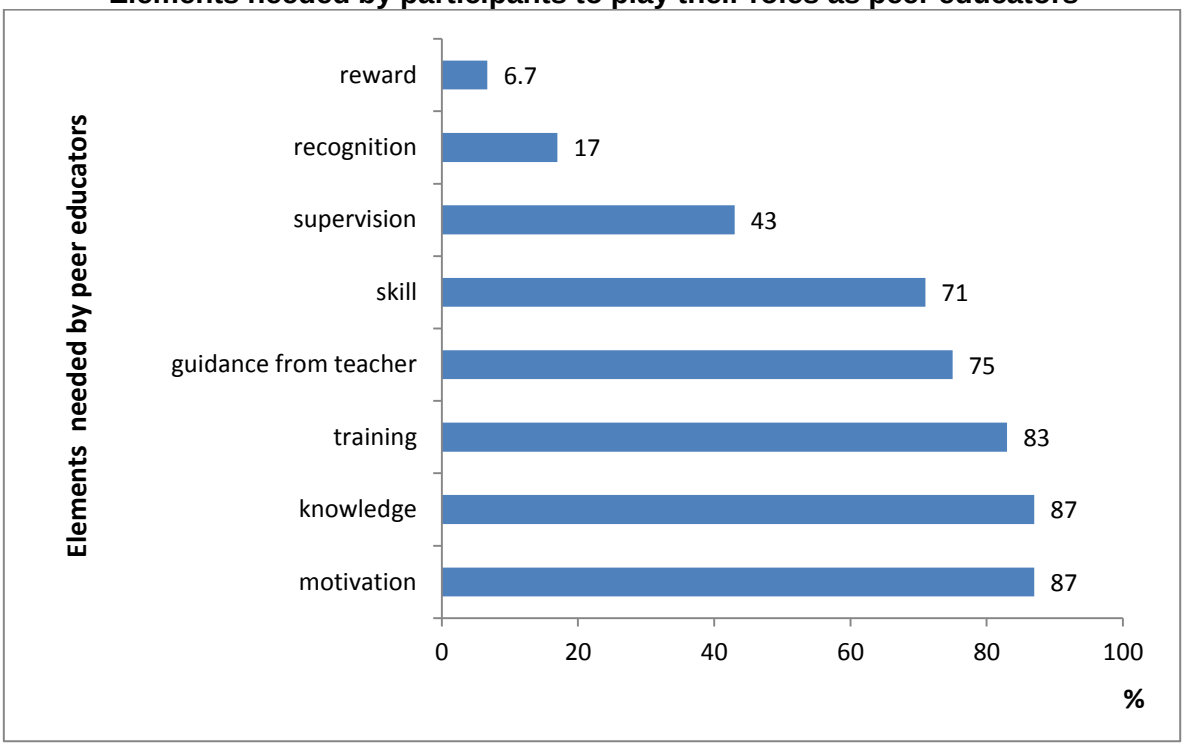


Figure 5.2 identifies the personal strengths that the students believed they had. The vast majority of students thought they were self-confident, were willing to help others and were brave and patient. More than half also thought they had good inter-personal skills and were consequently good listeners, able to work as a team and mixed well. However, just under half of the students did not believe they were good communicators.

Figure 5.2
Personal strengths that participants thought they had

5.5 Expectations for the peer educator training

During the focus group discussions the participants were asked what they expected from the peer educator training. Most students expected that the peer educator training would provide them with new knowledge especially about smoking issues such as reasons people start to smoke, effects and risks of smoking.

- *I wanted to learn more about the effects of smoking (Kal, boy, KK, IS1)*
- *I expected this training would explain in detail about smoking, why do people start to smoke (Hafiz, boy, KK, IS2)*
- *My teacher told me that we will be participating in a training course organised by the health department, something to do with smoking issues so I wanted to know more about the risks, effects, why the government is so concerned about smoking. Many people around me are smokers, my father, elder brother, neighbour, I want to know in detail about smoking (Khai, boy, KK, IS2)*
- *I hoped this training will give me more knowledge (Wani, girl, KK, IS2)*
- *Before I came here the teacher told us that we will train to be peer educators to prevent adolescents from starting to smoke. I agreed to attend because I wanted to know in detail about smoking issues, in my family most of them are smokers (Fara, girl, Keningau, IS3)*
- *I wanted to know why smoking is dangerous (Elly, girl, Keningau, IS3)*

- *Perhaps we may learn about smoking information so that we could help our friends to not to smoke (Ben, boy, Keningau, IS4)*

- *I have a cousin who died because of cancer, he could not stop smoking, I wanted to learn more about smoking and it effects (Ain, girl, Keningau, IS4)*

It was also hoped that the training would clarify their roles in school and the type of activities they would be expected to undertake.

- *I wanted to know what activities I should do, so that we will be more active in helping our friends (Rina, girl, KK, IS2)*

- *I hoped this training will explain about our roles in school, how to educate and help our peers better (Bret, boy, Keningau, IS3)*

They consequently anticipated that the training would prepare them to be better peer educators.

- *I hoped this training will help me be… more resourceful, responsible, trustworthy and an example to our friends (Wani, girl, KK, IS2)*

- *I hoped this training could help me to be an excellent peer educator and knowledgeable (Fio, boy, Keningau, IS3)*

- *I wanted to be a good peer educator to people (Ady, boy, Keningau, IS4)*

- *I hoped to be a sensible, motivated and knowledgeable peer educator (Rey, boy, Keningau, IS4)*

5.6 Opinions regarding the role of a peer educators

In the focus group discussions the students were asked their opinions about the role of peer educators and the peer educator training. Selected students had various opinions and expectations about the role of a peer educator. Peer educators were expected to remain as non-smokers and to be shining examples for their friends.

- *..giving advice and showing a positive role-model to our friends (Fara, girl, Keningau, IS3)*

Most anticipated that as peer educators they would play an important role in helping their friends to abstain from smoking or motivate their friends to stop smoking. Most of them viewed

the role of peer educator as sharing knowledge about smoking issues especially the dangers and effects of smoking by advising and giving their opinions when having a conversation or discussion with their friends.

- *We may have discussions with friends on how to prevent adolescents from starting to smoke (Wee, boy, KK, I1)*
- *..advising our smoker friends by giving them information on the dangers of smoking and the content of cigarettes (Angie, girl, KK, I1)*
- *I would like to advise my friends about the dangers of smoking (Khai, boy, KK, I2)*
- *I will try to influence my friends not to smoke, encourage them not to get involved in social problems like loitering and escaping from school (Wani, girl, KK, I2)*
- *I want to help my smoker friends to stop smoking, it also helped to remind myself of never to start smoking (Shida, girl, Keningau, IS4)*
- *If I have a conversation with friends I could give my opinions about smoking issues and also give support and motivation to our smoker friends to stop smoking (Krista, girl, Keningau, IS4)*
- *…helping friends especially prevent them from starting to smoke (Dona, girl, Keningau, IS4)*

Some students also expressed their intention to help their family members to stop smoking by sharing their knowledge about smoking.

- *I want to help my family members to stop smoking, I will give them the information about the dangers and effects of smoking, most of my family members are smokers (Wena, girl, Keningau, IS3)*
- *I agreed not only to help friends but also my family members (Ain, girl, Keningau, IS4)*

One student also highlighted the potential role of peer educators in organizing activities during the anti-smoking campaign in school.

- *giving a hand in the school anti-smoking campaign like poster exhibitions, quizzes, health talks (Cella, girl, KK, I1)*

Other selected students thought that the brief of a peer educator was slightly wider. One participant thought that peer educators should be a listener for their friends if they have problems and also help their friends in their studies. Another student focused on helping the teachers in dealing with adolescents issues.

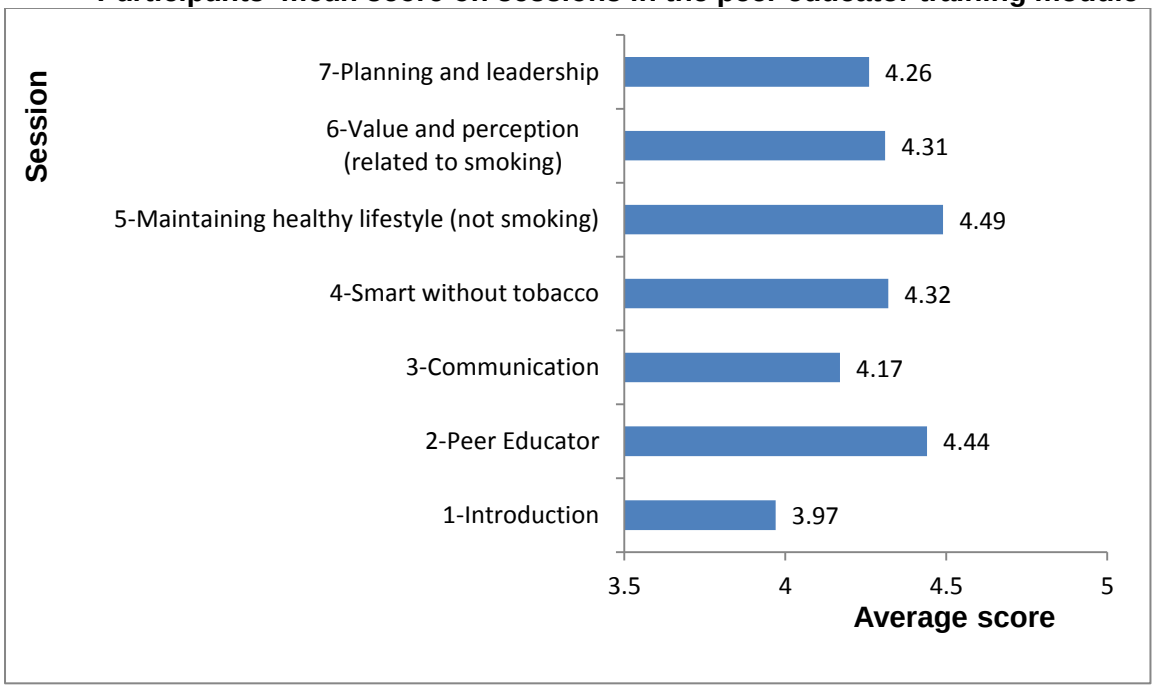
- *…helping others in their studies and become a good listener if our friends are having problems and try to understand them (Hafiz, boy, KK, IS2)*
- *helping our teacher especially the counseling teacher on adolescent related issues (Aya, girl, KK, I2)*

5.7 Assessment of the peer educator training module and programme

5.7.1 Delivery of sessions in the peer educator programme

Participants assessed each session in the questionnaire by selecting one from the five statements. The statements and corresponding scores were '1' for 'needs a lot of improvement', '2' for 'needs some improvement', '3' for 'satisfactory', '4' for 'good' and '5' for 'excellent'. Figure 5.3 shows the participants' mean scores for each module session. Six of the seven sessions in the peer educator module obtained a mean score of more than 4 and may be considered as 'good'. The highest mean score was for the fifth session on 'maintaining healthy lifestyles (not smoking)' followed by the second session on 'being a peer educator'. The lowest mean score was for the first session which was the 'introduction'.

Figure 5.3
Participants' mean score on sessions in the peer educator training module



The participants were asked to respond to nine previously prepared attitude statements which focussed on the potential effects of the training programme. Participants had four answer options for each statement; 'strongly disagree', 'disagree', 'agree' and 'strongly agree'. The participants' scores were '4' for 'strongly agree', '3' for 'agree', '2' for 'disagree', '1' for 'strongly disagree' and '0' for not answering. Table 5.8 shows the mean score for attitudes towards the training programme. Most of the attitude statements scored above 3 except the statement on training difficulty which scored 2.92. This may indicate that the participants thought they needed even more practical tasks and simulation. However, the highest mean score concerned the statement on usefulness and relevance and the statement on learning. Most participants agreed that the peer educator training was useful and relevant to them and appeared to have learned a lot and enjoyed the activities.

Table 5.8
Attitudes towards the training programme

Attitude towards the training programme	**Average score**
This training was useful and relevant	3.86
I have learned a lot from this training	3.78
The group work was fun	3.72
I learned new skills relating to handling peer pressure	3.65
I think I will be able to apply what I have learned from this training into my new role.	3.65
The facilitators prepared the sessions carefully	3.57
I found the training interesting	3.57
I was able to understand why the people ran the course	3.47
I did not find the training difficult	2.92

Participants were also given the opportunity to report on, at least one thing they liked, at least one thing they disliked and at least one thing they would change about the training programme. Table 5.9 shows the common themes that emerged from participants likes. The majority of participants liked the peer educator programme because they learned ways to

communicate effectively. Some also reported that they liked learning more about the dangers of smoking, the contents of cigarettes and the benefits of not smoking. A few students reported that the training also provided them with the opportunity to learn more about their roles as peer educators and how to influence their friends in relation to not smoking and how to handle peer pressure to start smoking.

Table 5.9
Participants' likes on the peer educator training programme

District of Keningau (total number of participants = 38)	District of Kota Kinabalu (total number of participants = 35)
• Knowing ways to communicate (15) • Knowing the dangers of smoking (6) • Knowing the contents of cigarettes (5) • Session 4: Smart without tobacco (3) • Knowing the role of a peer educator (2) • Knowing how to influence peers (2) • Knowing how to handle peer pressure (2) • Role play (1) • *No comments* (1)	• Knowing the dangers of smoking (7) • Knowing the role of a peer educator (4) • Working in group (3) • Knowing ways to communicate (3) • Knowing the contents of cigarettes (2) • Knowing how to handle peer pressure (2) • Meeting other students from different schools (2) • Smart without smoking (2) • Learning new skills (1) • Reflection session (more respect and love for parents) (1) • Learning how to make decisions (1) • Value and perception (drifting at deep sea activity) (1) • More self-confidence (1) • More knowledge (1) • *No comments* (3)

Note:

( )-number of participants

5.7.2 Favourite session in the peer educator training

The seven sessions were introduction, being a peer educator, communication, smart without tobacco, maintaining a healthy lifestyle, value and perception and planning and leadership. The sessions included talks, role-plays, small group-discussion, presentations, games and video clip displays.

The responses from participants varied according to the district where the peer educator training was held. This was because some of the sessions were handled by different facilitators. Generally, the participants liked activities which were fun and made them interact with each other.

Even though there were variations between the districts, four sessions seemed to be more popular than the others. These sessions were the session on communication, maintaining a healthy lifestyle not smoking, smart without smoking and introduction. The most popular session was maintaining a healthy lifestyle not smoking which was presented through role-play. Playing the role according to the given scenario was something new for the participants, especially the scenario on handling peer pressure and helping friends not to start smoking. These findings were supported by the focus group discussions.

- *..acting according to the scenario on how to handle the peer pressure (role- play) (Mat, boy, KK, IS2)*
- *…scenario session (role-play), acting our own role, it was something new to me (Aya, girl, KK, IS2)*
- *I liked the role-play on handling peer pressure scenario and how to avoid smoking (Bret, boy, Keningau, IS3)*
- *I liked the role-play so that I know how to help friends to stop smoking (Ali, boy, Keningau, IS3)*
- *I liked the session on preventing adolescents from starting smoking that was handling the peer pressure (Krista, girl, Keningau, IS4)*

The second most popular session was on communication. The participants liked the session because it enabled them to understand the process of communication through games. The participants practiced communicating effectively and learned how to start a not smoking related conversation with friends.

- *communication session (Wena, girl, Keningau, IS3)*
- *I like the communication session, we practiced communicating with each other and it will help us in our daily talks and actions (Rafi, boy, Keningau, IS4)*
- *communication; communication process, tips to be a good listener and the mummy game (Shida, girl, Keningau, IS4)*
- *communication session and role-play on how to handle the peer pressure (Dona, girl, Keningau, IS4)*

The participants liked the session entitled 'Smart without tobacco' which explained the contents of cigarettes, smoking related diseases, effects and risks of smoking. This session was presented through talks by the facilitator and was followed by a documentary presentation of the contents of cigarettes. Knowledge about smoking related issues was essential to the objectives of their role as peer educators to prevent the uptake of smoking.

- *I liked the session on smoking especially watching the slide on experimenting with the contents of smoke (Era, girl, KK, IS1)*
- *..smart adolescents don't smoke (Wan, boy, KK IS2)*
- *I like the session on understanding tobacco because before that I did not know the contents of cigarettes but after watching the documentary, I knew how dangerous the contents of cigarettes are (Fio, boy, Keningau, IS3)*
- *I liked the session on how to prevent smoking because it gave me knowledge, which is relevant if I want to help to prevent smoking and help in our role as a peer educator and motivated me to be a confident peer educator (Rey, boy, Keningau, IS3)*
- *Explanation about the contents of cigarettes (Ben, boy, Keningau, IS4)*

The participants particularly from the District of Kota Kinabalu expressed their liking of the first session which was the introduction. It made the participants interact with each other and form friendships.

- *introduction, role-play and group discussion (Wee, boy, KK, IS1)*
- *introduction, communication and smart adolescents don't smoke (Chun, boy, KK , IS1)*
- *introduction and role play because it was fun (Din, boy, KK,IS2)*
- *introduction and role of peer educator (Hafiz, boy, KK, IS2)*
- *I liked the introduction, it was fun and I got new friends (Wani, girl, KK, IS2)*
- *introduction, role of peer educator, value and perception (Khai, boy, KK, IS2)*
- *introduction, scenario on how to handle the peer pressure and communication (Din, boy, KK, IS2)*
- *introduction and communication session (Elly, girl, Keningau, IS3)*

Table 5.10 shows the shows the common themes that emerged from the questionnaire concerning participants' dislikes in relation to the peer educator training. A sizable proportion (n=31; 42.5%) reported that there was nothing they disliked about the programme. Of those that did report that there was something they disliked most focussed on the reflection session. Some, especially amongst boys from the District of Kota Kinabalu, also reported that they did not like the role-play activities. In the District of Keningau, a small minority of students did not like waking up early which they were required to do as they needed to queue to use the toilet and bathroom. Three students used this opportunity to highlight again their dislike of the introduction session.

Table 5.10
Participants' dislikes concerning the peer educator training programme

District of Keningau (total number of participants = 38)	District of Kota Kinabalu (total number of participants = 35)
• Reflection session (8) • Wake up early (3) • Introduction session (2) • Communication (1) • Forming the group dynamic (1) • Listening to talks (1) • Time for prayer (1) • Morning exercise (1) • Wearing the big size nametag (1) • *No comments (18)*	• Reflection session (6) • Role-play (4) • Mark deduction (3) • Listening to talks (2) • No action for participants who are not punctual (1) • Communication (2) • Introduction session (1) • *No comments (13)*

Note:

( )-number of participants

Table 5.11 shows the shows the common themes that emerged from the questionnaire concerning participants' suggestions for changes to the peer educator training. Participants from both training venues suggested adding more educational games to the peer educator training programme. In the District of Keningau five participants suggested extending the training duration and three participants suggested that the training should be continued. Promoting motivation and facilitating the development of listening skills was raised by a few students. A very small minority suggested a number of possible activities.

Table 5.11
Participants' suggestions on the peer educator training programme

District of Keningau (total number of participants = 38)	District of Kota Kinabalu (total number of participants = 35)
• More educational games (7) • Extend the training duration (5) • Continue this training (3) • More motivation (2) • Know how to help friend to stop smoking (2) • Plan the training carefully in the future (1) • Training material, needs to be realistic (1) • Surprise activities (1) • Listening skills (1) • *No suggestion (14)*	• More educational games(2) • More group work (2) • More cultural activities (1) • Talent session (1) • Add telematch (1) • More talks (1) • More motivation (1) • Assessment for physical stamina (1) • Listening skills (1) • Add quiz (1) • *No suggestion (22)*

Note:

( )-number of participants

In addition to rating each session in the questionnaire, participants were provided with an opportunity within the questionnaire to give their suggestions for each session. Table 5.12 shows the general themes of the suggestions for each session. The first session on 'introduction' received comments from 15 participants. However, the comments could be summarized into two main issues. First, participants should be provided with the opportunity to introduce themselves individually. Second, the time that was dedicated to allow students to introduce themselves should be limited so that everyone had a chance to introduce themselves. Suggestions for the other sessions were primarily related to time constraints, having more activities, more group work, more practical assignments and more time for group work preparation. In addition, there were also comments about the facilitator including that the facilitator should speak louder, be friendlier and include more pictures in her/his talks.

Table 5.12
Suggestions for improvement on module sessions

Session	Comments
Session 1: Introduction	• All participants should introduce themselves individually (9) • Limit time for selective self-introduction so that others had chance to introduce themselves (6)
Session 2: Peer educator	• More group work (2) • More activities (1)
Session 3: Communication	• Encourage participants to practice to speak in front of the whole group (1) • Add more activities (1) • Outdoor activities (1) • Facilitator should be more friendly (1) • Add more pictures (1) • Train the participants not to be shy (1) • Facilitator should speak louder (2)
Session 4: Smart without tobacco	• Facilitator did not explain the topic precisely (3) • Give more detailed information about smoking (1)
Session 5: Maintaining healthy lifestyle (not smoking)	• More time for preparation of group presentations (1) • Participants were not serious with their roles in scenario (1)
Session 6: Value and perception (related to smoking)	• Reflection session needs to be improved (1)
Session 7: Planning and leadership	• Provide all participants with the opportunity to present their views (1)

Note:

( )-number of participants

Suggestions to improve the peer educator training programme in the future were also made during the focus group discussions. Most of participants commented on the training duration which was conducted for three days and two nights. They said the training duration should be extended because some of the activities were too short. They wanted more activities and time for group discussions, presentations, role-plays, games and morning exercise.

- *Extend the training duration a bit longer e.g 1 week (Din, boy, KK, IS2)*
- *..morning exercise was too short, more sport activities like badminton, futsal, volleyball, tennis frisbee (Angie, girl, KK, IS1)*
- *The …time duration too short (Hafiz, boy, KK, IS2)*

- *…extend the training duration a bit longer to more than 3 days 2 nights. (Ain, girl, Keningau, IS4)*

- *…more group discussions and extend the training duration to a bit longer' (Shida, girl, Keningau, IS4)*

The participants also suggested a few activities that could be added to the peer educator training programme. They wanted a slot for some kind of an entertainment such as having a telematch, a talent night so each of the group could work together for their presentation and humorous games to convey the smoking issues.

- *add more acting activities (role-plays), more humour during talks and improve the morning exercise/afternoon recreation e.g. jogging, football not just body stretching (Khai, boy, KK, IS2)*

- *..include those humorous games like scrabble, sahiba, crosswords, puzzle (Aya, girl, KK, IS2)*

- *It would have been nice to have tele-match (Wani, girl, KK, IS2)*

- *I would like to have talent night like cultural presentation, singing, dancing by group (Rina, girl, KK ,IS2)*

- *I suggest the training should have more educational games so that participants are happy and relaxed, learning and enjoying at the same time (Rey, boy, Keningau, IS3)*

A few participants suggested a different venue

- *Training can be done through camping (Mat, boy, KK, IS2)*

- *I wish to join more training like this, we can have training by camping, as long the locality is secure and has basic equipment/utilities. (Krista, girl, Keningau, IS4)*

Some of the participants in the focus group discussions made comments about the training that could be construed as suggestions for changes to the training programme. Some students, for example, expected that the sessions would be delivered by more experienced facilitators.

- *..more experienced facilitators (Wena, girl, Keningau, IS3)*

Additionally, some reported that they would have preferred the sessions that were primarily slide presentations to be humorous and alive.

- *The health talks should be alive and include humour (Ana, girl, KK, IS2)*

Although the focus tended to be on fun activities one participant also recognized that the facilitators needed to support the participants by maintaining order

- *Facilitators need to be firm and strict for those participants who were playful (not serious) during the role-play session. During morning exercise, it was too short and some participants were not punctual (Chun, boy, KK, IS1)*

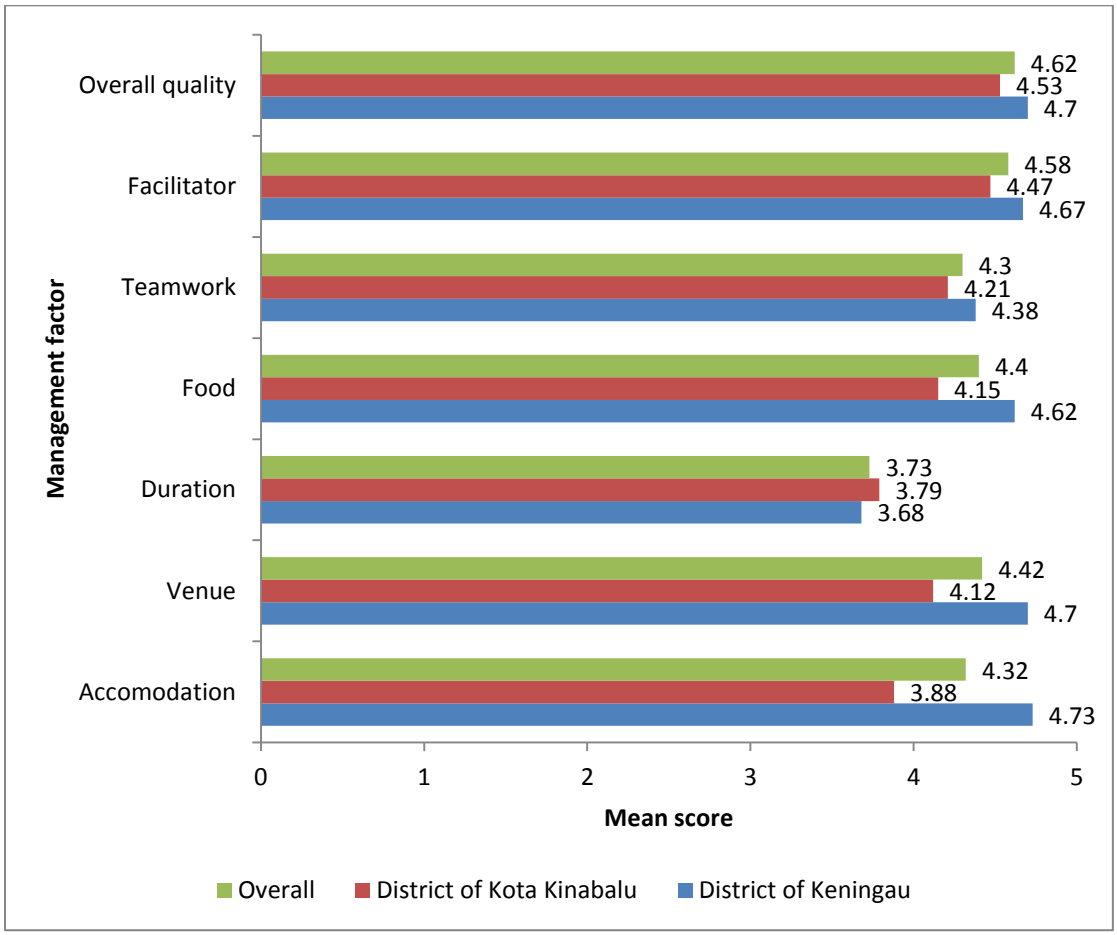
One participant voiced her concerns about the session on reflection of values by appreciating the sacrifice of their parents. This was because the father of one of the participants had died recently.

- *I don't really like the reflection session, it is good to remind us how our parents love, work hard and sacrifice for our sake, but I pitied one of the participants from our school, he just lost his father, I think it needed to be adjusted in certain context, we're not ready to imagine and express our feeling if we lose our parents (Lina, girl, Keningau, IS4)*

5.7.3 The management of training programme

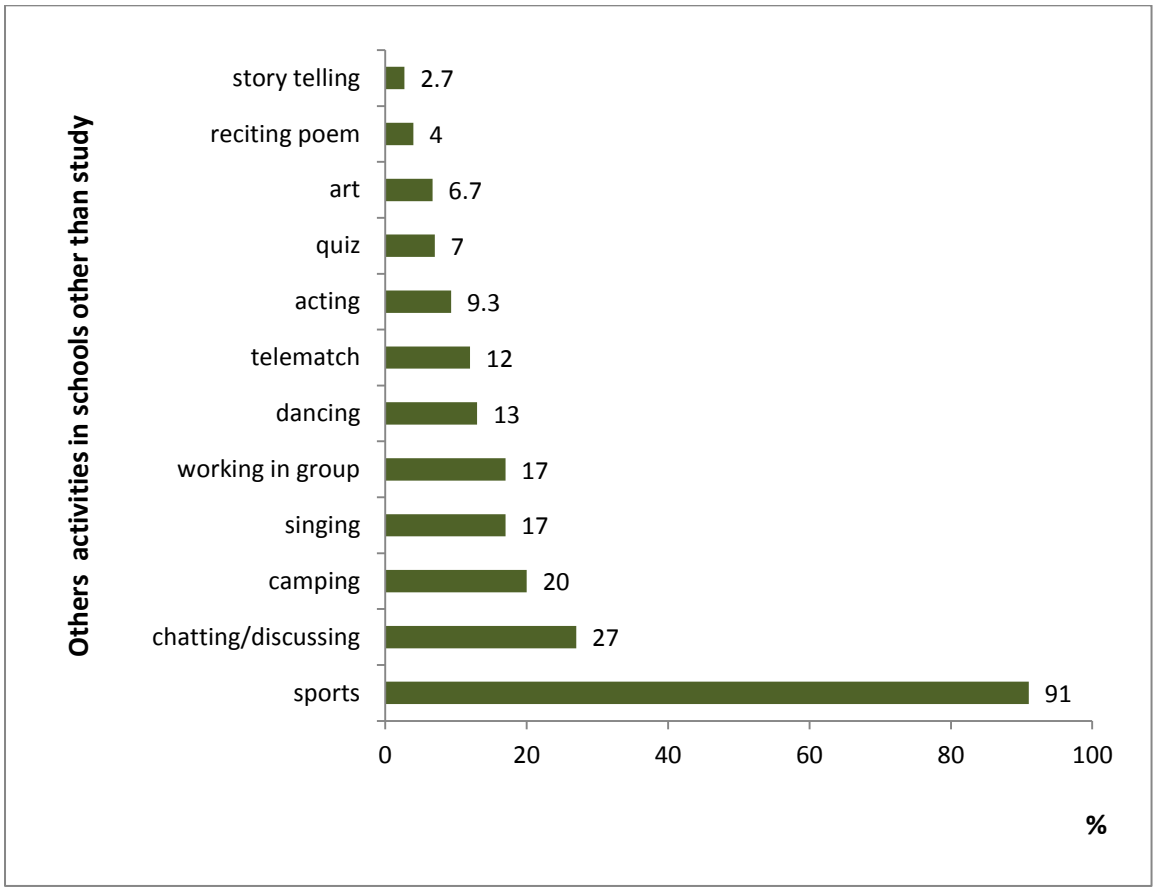
The final section of the peer educator programme assessment questionnaire focussed on the management of the training. In addition to providing a score for overall quality, students were asked to rate the facilitators, teamwork, food, duration, venue, and the accommodation. Students were provided with five answer options; 'poor = 1', 'fair = 2', 'good = 3', 'very good = 4' and 'excellent = 5'. Figure 5.4 shows the mean quality rating for each component of the management assessment. Participants in the District of Keningau gave higher quality ratings for everything except the duration. The mean score for overall quality and most of the management components were rated above 4 except the duration of training and accommodation in the District of Kota Kinabalu. The lower rating for duration of training indicated the need to modify the time table for the peer educator training in the future. A sample of the time table for the peer educator training is located in Appendix 5.1 (attachment a). In relation to the accommodation in the District of Kota Kinabalu, one participant commented in the questionnaire that the toilet was too far from the training room and one participant was afraid to sleep at night.

Figure 5.4
The quality rating for management of the peer educator training



For the purpose of future training, it is important to know what kind of activities the students liked being involved in outside from academic learning in school. Figure 5.5, shows that the vast majority of students liked being involved in sport activities in school. The most popular sport was badminton, followed by football, volleyball and netball. About a quarter of the students liked to chat/discuss with each other and a slightly smaller proportion liked school camping.

Figure 5.5
Activities that participants like to involve in at school



5.7.4 Assessment of knowledge and attitudes before and after the peer educator training

5.7.4.1 Knowledge

The knowledge questionnaire was comprised of 12 statements which the participants answered 'true', 'false' and 'do not know'. The participants' scores were '2' for a correct answer, '-2' for a wrong answer and '0' for a 'do not know' answer. Table 5.13 shows the mean scores for participants' knowledge of smoking related issues before and after the peer educator training. Participants' mean knowledge score was increased by 1.96 after they completed the peer educator training. In addition, more than 70% of the participants had increased knowledge after the training. Participants from the District of Keningau had higher mean scores before and after the training.

Table 5.13
Participants' knowledge scores on smoking related issues before and after the peer educator training

Location	Knowledge (Mean score)	
	Pre	Post
District of Kota Kinabalu	7.74	9.51
District of Keningau	8.11	10.25
Overall	7.92	9.88

5.7.4.2 Attitudes

The attitudes assessment was also comprised of 12 statements which participants answered 'strongly agree', 'agree', 'disagree' and 'strongly disagree'. If the statement was positive, the participants' scores were '2' for 'strongly agree', '1' for 'agree', '-1' for 'disagree', '-2' for 'strongly disagree' and '0' for not answering. Table 5.14 shows the mean scores for participants' attitudes on smoking related issues before and after the peer educator training. Participants' mean scores for attitudes were increased by 3.39 after they completed the peer educator training. In addition, more than 77% of the total participants had improved attitudes after the training. Participants from the District of Keningau had a higher mean score than participants from the District of Kota Kinabalu.

Table 5.14
Participants' attitudes scores on smoking related issues before and after the peer educator training

Location	Attitude (Mean score)	
	Pre	Post
District of Kota Kinabalu	17.54	21.08
District of Keningau	18.83	22.06
Overall	18.18	21.57

5.8 Participants' experiences as peer educators

Participants' experiences of being a peer educator were ascertained during the second set of focus group discussions. In these discussions I asked the participants to share their experiences as peer educators. Most reported that they had advised, given their opinions and shared their knowledge about smoking issues particularly the risks and disadvantages of smoking, the contents of cigarettes and the benefits of not smoking. It appeared that most participants had willingly discussed these issues with friends who smoked and friends who did not smoke. Most participants also reported that they had undertaken peer educator related activities outside of school for example on their journey back from school and when they were at their own house.

- *I gave advice to a few smoker friends and reminded them of the risks of smoking and advantages of not smoking (Jonas, boy, KK, IS1)*
- *Before the peer educator training, I never used to give my opinions about smoking. After the training I shared my knowledge with friends about the disadvantages and the effects of smoking and advised them never start smoking, it's difficult to stop smoking once addicted (Chang, boy, KK, IS1)*
- *I gave advice to my smoking friends to stop smoking; I said it is useless to continue smoking. I also shared ideas and opinions with non-smoker friends to never start smoking, the dangers of smoking, the content of cigarette such as nicotine and chemical material (Bret, boy, Keningau, IS3)*
- *I advised my friend to stop smoking, explained to him the health risks of smoking (Richi, boy, Keningau, IS4)*
- *I gave my opinions about smoking while waiting for the school bus to go back home (Lidia, girl, Keningau, IS4)*

The peer educators faced a challenging reaction from their peers who smoked when they started talking about smoking issues. Friends who smoked did not want to believe what the peer educators had to say about smoking issues and tried to discredit them. However, the peer educators in their efforts to raise awareness about cigarette use did receive support from friends who had never smoked.

- *I told my friends to not start smoking. If I talked about smoking to smoking friends they said many things to discredit me but friends who don't smoke they don't say anything, they listen and support me (Wong, boy, KK, IS1)*

- *If they are already a smoker, no matter what you say they don't believe you (Jerod, boy, Keningau, IS4)*

The peer educators also had conversations about smoking issues with their siblings, parents, relatives and neighbours. However, they realized that it was difficult to talk about smoking matters to someone older than they were. They were more comfortable having conversations with friends of their age.

- *'I talked about smoking to my uncle and cousin but they didn't want to listen. I also talked to my neighbour about smoking' (Kal, boy, KK, IS1)*

- *'I talked to my father about the risks of smoking, not only that, I also said that smoking is a waste of money' (Elsi, boy, Keningau, IS3)*

- *'I feel it's difficult to talk or give an opinion about smoking to those people who are much older or much younger than me, I feel more comfortable talking or advising my same age peers' (Arul, boy, Keningau, IS3)*

- *'I not only gave advice about the dangers of smoking to my friends but also to my neighbours and uncle' (Shida, girl, Keningau, IS4)*

- *'I did talk to my elder brother about the dangers of smoking but he did not believe it' (Esther, girl, Keningau, IS4)*

Many felt more confident when talking about smoking issues either with their friends or in public.

- *I have become more confident giving my opinions especially about smoking issues (Arul, boy, Keningau, IS3)*

- *I am confident enough to talk to people in my village especially when sharing the information I got about the content of cigarettes and its risk…'(Noor, boy, Keningau, IS3)*

- *I have become more confident talking in public, before this I was a bit shy (Fio, boy, Keningau, IS3)*

The participants shared their experiences dealing with their classmates who smoked. As they were the same age as their peers, the peer educators knew which of their classmates smoked because of the smell of their breath. In addition, they also knew the places in the school where their peers would go to smoke. In Malaysia, smoking within the school compound was

considered as an offence. Some peer educators reported to their teachers the places where their peers go to smoke in school.

- *I told the discipline teacher about our classmates who smoke and the location they used to smoke in school such as behind the resource centre and toilet (Rey, boy, Keningau, IS4)*

Some of the participants felt ill at ease being a peer educator because some of their friends liked to mock their role. However, some ex-smoker peer educators were empowered to stay non-smokers even though their friends tried to persuade them.

- *I don't feel comfortable being a peer educator because sometimes my friends like to ridicule my role as peer educator (Kal, boy, KK, IS1)*
- *Before I was chosen as peer educator, I was a smoker but now I already stopped. Some of my friends tried to persuade me to smoke but now I know ways to avoid smoking (Wong, boy, KK, IS1)*

5.9 Approaches to influence peers from starting to smoke

The peer educators tried to influence their friends from starting to smoke by sharing their knowledge about smoking. The most popular approach was telling their friends about the risks and effects of smoking. When the peer educator showed pictures of the effects of smoking, their friends responded that the pictures frightened them and they were afraid of dying early. Their friends believed what the peer educators said especially when there was evidence to support their view. The father of one of their classmates who was known to be a smoker had been paralysed due to a stroke which was believed to be related to the father's smoking habit.

In addition, the peer educators also talked about the contents of cigarettes and the disadvantages of smoking. One peer educator reported that their friends did not know about the contents of cigarettes until the peer educators talked about the experiments to show the contents of cigarettes and the video display which showed the experiments.

- *I told my friends about smoking so that they will be aware about the risks of smoking, disadvantages of smoking and the effects of smoking (Roger, boy, KK, IS1)*

- *I talked to my friends about the disadvantages and effects of smoking, the tar content of cigarettes which was proven through experiment. Their reactions were mixed, some were afraid and some showed no emotion. Before that they didn't know the contents of cigarettes were nicotine, tar, formaldehyde etc (Ella, girl, Keningau, IS3)*

- *I showed smoking related pictures to my friends, some of them were afraid, shocked, they don't want to see, maybe they were frightened of dying early (Elly, girl, Keningau, IS3)*

- *Whenever I talked to friends who were not smokers about the risks of smoking, they believed it. Moreover one of my friend's father who was a smoker, he is partly paralysed because of stroke (Krista, girl, Keningau, IS4)*

5.10 Activities of peer educators in school

The peer educators reported that no specific programmes concerning smoking were being planned in their school due to time constraints. Most of their smoking related activities focussed on having informal conversations and interactions with their peers. Some attended a health talk about smoking once which was delivered by health staff.

- *We don't have any programmes because we have no time (Wong, boy, KK, IS1)*

- *There is no specific programme, it's just having a conversation about smoking during lunch time or walking back to or from school (Fio, boy, Keningau, IS3)*

- *We do our own activities such as having an informal conversation with friends about smoking and then record it in the log book (Noor, girl, Keningau, IS3)*

- *We don't have special programmes. There was one time we attended a health talk about smoking presented by health staff (Shida, girl, Keningau, IS4)*

5.11 Opinions of friends about the peer educator programme

The participants shared their experiences of the peer educator training programme with their friends. There were many responses from their peers in relation to the peer educator training. Since the selection was decided by their teachers, their friends did not know the details of the peer educator training beforehand. Their friends wondered about their selection for the training.

- *Some of my friends were interested to be peer educators (Roger, boy, KK, IS1)*
- *My friends asked me, how could I had been chosen for the peer educator training (Ella, girl, Keningau, IS3)*

Their friends were also curious about the activities during the training and the participants' feelings about the training.

- *My friends asked about the peer educator training. What was the most interesting part in that training (Chang, boy, KK, IS1)*
- *My friends asked about the activities during the peer educator training so I told them that we got health talks, group work, games, group presentations (Era, girl, KK, IS1)*
- *They did ask whether we're happy or not to have participated in the training (Elly, girl, Keningau, IS3)*

The peer educators also had to explain what they were expected to do when they got to school after the training.

- *They asked what activities we will be doing (Arul, boy, Keningau, IS3)*
- *They asked us about the activity that we should do at school after the peer educator training (Ester, girl, Keningau, IS4)*

After the participants explained the activities and their experiences during the training, many of their peers praised them for their willingness to be peer educators. However, some of the peer educators reported that some of their peers were jealous as they would have liked to have been selected to go on the peer educator training.

- *Some of my friends gave me compliments for being a peer educator and asked about the activities during the peer educator training (Era, girl, KK, IS1)*
- *Some of my friends were jealous when we were chosen to be peer educators, the teacher did not choose me but I went to see her and offered voluntarily to be a peer educator (Esa, girl, KK, IS1)*
- *Some of my friends were jealous when we went for the peer educator training, they asked why we were chosen by the counselling teacher (Lina, girl, Keningau, IS4)*

5.12 Lessons learned from being a peer educator

The participants knew they were expected have an informal conversations about smoking issues with peers and also realized that as peer educators they should be knowledgeable about that particular topic.

- *If we want to give advice on certain issues, we must have knowledge about these issues (Noor, girl, Keningau, IS3)*

However, as peer educators, the participants learned that their roles were more than just sharing information with friends. In order to play their roles better, they needed to be self-confident when talking and needed to be able to start a conversation with others especially about smoking related issues. Additionally, they believed they needed to keep on self-improving and be shining examples to their peers.

- *As a peer educator, our roles are more than advising, educate our friends but we need to look at ourselves, we need to be a good role-model, improve ourselves first before we help others. Confidence and improve our weaknesses (Bret, boy, Keningau, IS3)*
- *We should challenge ourselves and dare to start a conversation with others (Elly, girl, Keningau, IS3)*
- *As a peer educator, we need to have self-confidence when we talk to people (Ella, girl, Keningau, IS3)*
- *I have become braver about telling others not to start smoking because I got the information about the risks of smoking and the content of cigarettes (Richi, boy, Keningau, IS4)*
- *I have become more confident and enthusiastic about talking and giving my opinions about smoking issues, particularly with the support from other peer educators (Lita, girl, Keningau, IS4)*

If they were confronted with a negative situation, they knew they had to be patient and try to understand the situation.

- *If we are facing a negative situation, we should be patient and not easily give-up (Fio, boy, Keningau, IS3)*
- *I need to be patient/understanding. I know one of my friends was forced to smoke by a family member when he was in a primary school, after a while he became addicted to smoking (Jerod, boy, Keningau, IS4)*

According to the participants, undertaking their roles as peer educators helped them to be empathetic to the feelings of their friends. As a result, the peer educators formed closer friendships with their peers.

- *Being a peer educator is really an eye and heart opening for me to understand the feeling of others. My relationship with friends is closer now (Krista, boy, Keningau, IS4)*
- *I understand my friends more when I help them (Lidia, boy, Keningau, IS4)*

Besides helping their friends with smoking, the peer educators listened and supported their friends who had problems in their studies. They were happy if their friends appreciated their opinions.

- *I gave advice to my classmates who were having problems with their studies. They like to share problems with me, I gave them support, I have become a listener to their problems. I'm happy they appreciate my opinion. (Ella, girl, Keningau, IS3)*

They also learned that talking about smoking issues to friends who smoked was difficult, but if they were close to the friends who smoked these friends still wanted to listen to what the peer educators had to say.

- *I feel it is difficult to talk about smoking issues to smoker friends…..if we talk to close friends, they are willing to listen (Ben, boy, KK, IS1)*

5.13 Difficulties of saying 'No' to the peer pressure to start smoking

One of the aims of the peer educator training programme was to provide the peer educators with the skills to handle pressure particularly in relation to pressure from peers to start smoking. The majority of the participants told me that they had been offered a cigarette at least once from their peers or someone older than them. When they were asked about how difficult it was to say 'No' to the offer of a cigarette from peers, the participants' responses were mixed. They compared their situation before and after they attended the peer educator training. After attending the training, the participants said they were more confident about

resisting cigarettes. It was easy to say 'No' to offers of cigarettes if they did not like the smell of cigarettes and knew about the disadvantages of smoking.

- *Before the training, it was a bit difficult because my friends forced me to try smoking. Now it is easy because if they offer me a cigarette I will say directly that I don't smoke, if they insist I'll ignore them and walk away (Ben, boy, KK, IS1)*

- *When I was in primary school, I was easily influenced. One time when I was in year 6, my friends forced me to try smoking but I remembered my parents' advice about disadvantages of smoking. Now if my brother offers me a cigarette, it is easy to say I don't smoke (Fio, boy, Keningau, IS3)*

- *It is easy now, before this I have a friend who was upset and threatening not to be my friend forever if I don't smoke (Bret, boy, Keningau, IS3)*

- *If we hate the smell of cigarettes, no matter what and how people do, I will say I don't smoke. For me it's easy to say 'NO' to negative influence (LIta, girl, Keningau, IS4)*

The peer educators thought that being a smoker was promoting a bad image for an adolescent.

- *Not a good image if you are smoking (Jonas, boy, KK, IS1)*

Some male participants said that it was quite hard to say 'No' if close friends offered them cigarettes particularly in situations where they were surrounded by friends who smoked. Adolescents are curious about trying new things especially when children are not allowed to do it but it is common practice among adults.

- *Before the training, I tried smoking but not anymore. If close friends offer me a cigarette, it is difficult to say you don't want to (Wong, boy, KK, IS1)*

- *Perhaps it is difficult, I'm curious to try it [smoking] but I keep reminding myself to remember my parents advice not to smoke, it is not easy for them to send me to school (Arul, boy, Keningau, IS3)*

- *It is quite difficult because adolescents like to try (Aidi, boy, Keningau, IS3)*

- *It's difficult to say 'NO' when our close friends force us to start smoking if we hang around in a group or environment where most of our friends are smokers. Also, adolescents are curious and want to try new things (Asraf, boy, Keningau, IS4)*

5.14 Log Book evaluation

The log book was a diary in which the participants recorded all their activities related to their roles as peer educators in the prevention of smoking. In the last session of the peer educator training, participants were briefed on how to use the log book and practiced using the log book with applicable scenarios. The contents of the log book were 'date', 'activity', 'target group' and 'location' (Appendix 5.3). Participants were asked to carry out activities such as having informal personal conversations (PT), participating in discussions (D), participating in an anti-smoking campaigns (ASC), giving opinions (GO), helping friends (HF), involvement in school/community outreach (O) and other activities (OT). The target group was divided into three categories; 'individual (I)', 'small group (less than 10 people-SG)' and 'mass (10 people and more-M)'. Participants were allowed to carry out their activities in school (S), at home (H) and outside their school/home (OSH). The data from participants' log books were transferred to a log book analysis sheet which was analysed (Appendix 5.4).

5.14.1 Characteristics of peer educators who returned their log books

Peer educators were asked to return their log books at seven months follow-up. Table 5.15 shows that only 67% of the total number of peer educators handed in their log book (n=49). The characteristics of the peer educators who returned their log books is shown in Table 5.15. More boys than girls were recruited to the peer educator training programme. However, there was a noticeable gender difference in the return of the log books. Female peer educators were more likely to return their log books (n= 28/35 =80%) than male peer educators (21/38=55%). The attrition rate for log books submission was lower in the District of Keningau (29/38=76%) than in the District of K Kinabalu (20/ 35=57%).

Table 5.15

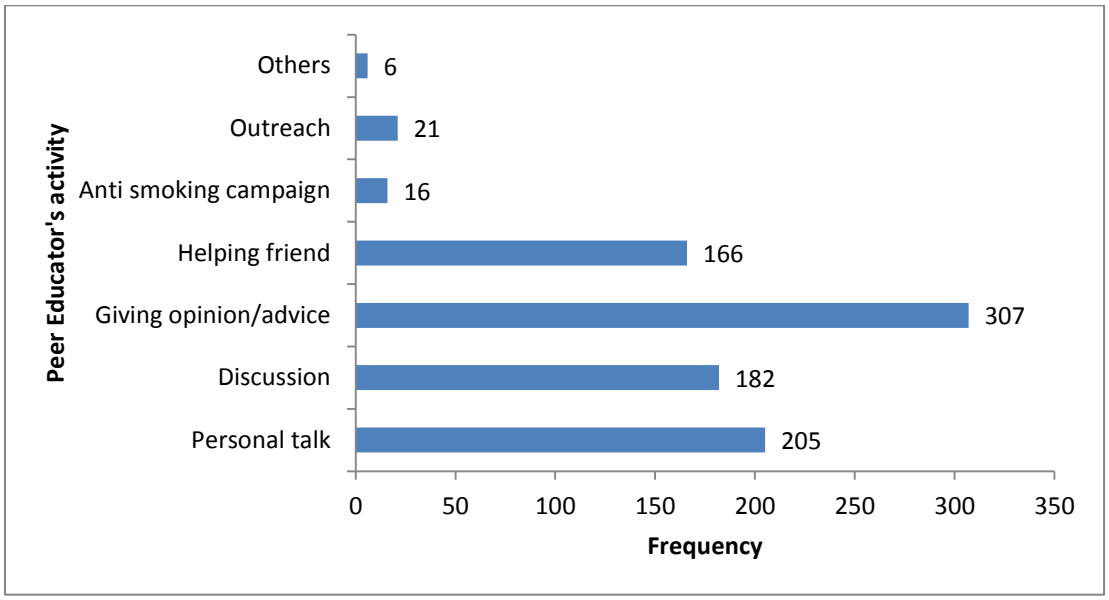
Characteristics of the peer educators who returned their log book at 7 months

Peer Educator	Number of participants		Total Participants
	District of Keningau	District of K Kinabalu	
Handed-in the log book at 6 months follow-up	29	20	49
Gender			
• Boy	13	8	21
• Girl	16	12	28
School			
• I1	-	6/12	6
• I2	-	14/23	14
• I3	16/19	-	16
• I4	13/19	-	13

5.14.2 Analysis of activities in the log book

Figure 5.6 shows the peer educators activities that were recorded in their log books. Giving opinions/advice was the most popular activity (40%). This was followed by having an informal and personal conversation with friends (23%). Peer educators also carried out their roles by having discussions generally and helping their friends.

Figure 5.6
Analysis of log book on activities of peer educators



5.14.3 Target group and location

Figure 5.7 indicates the target group for the peer educators. A similar number of activities were targeted at small groups of less than 10 people (44%) or individuals (43%).

Figure 5.7

Target group of peer educators

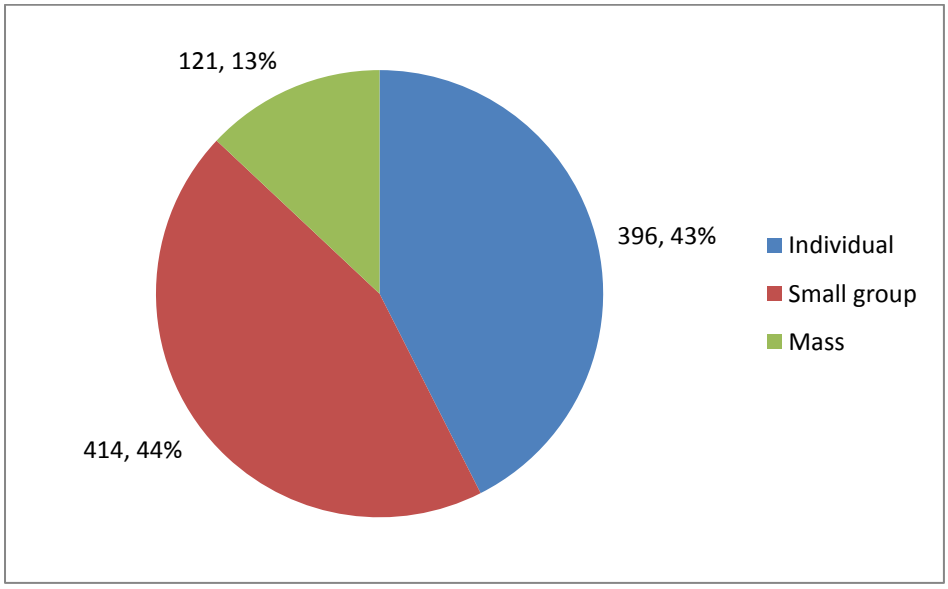
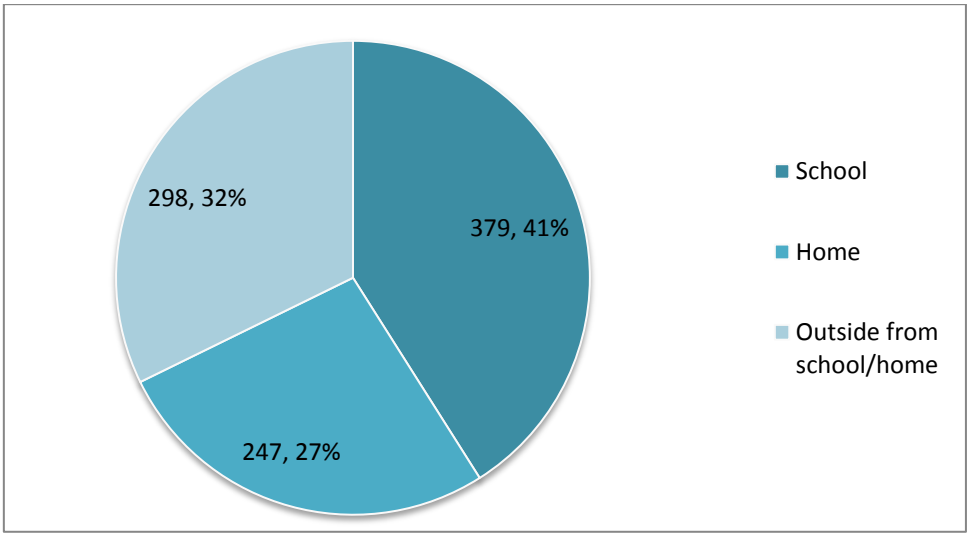


Figure 5.8 shows the location of peer educator activities. One of the main aims of the peer educator training was to encourage the peer educators to try to influence their friends not to start smoking. It was not surprising therefore that most of the peer educator activities were conducted in school (41%). However, a relatively high proportion of peer educator activities were conducted in locations outside from school or home (32%) which was a little surprising but welcomed.

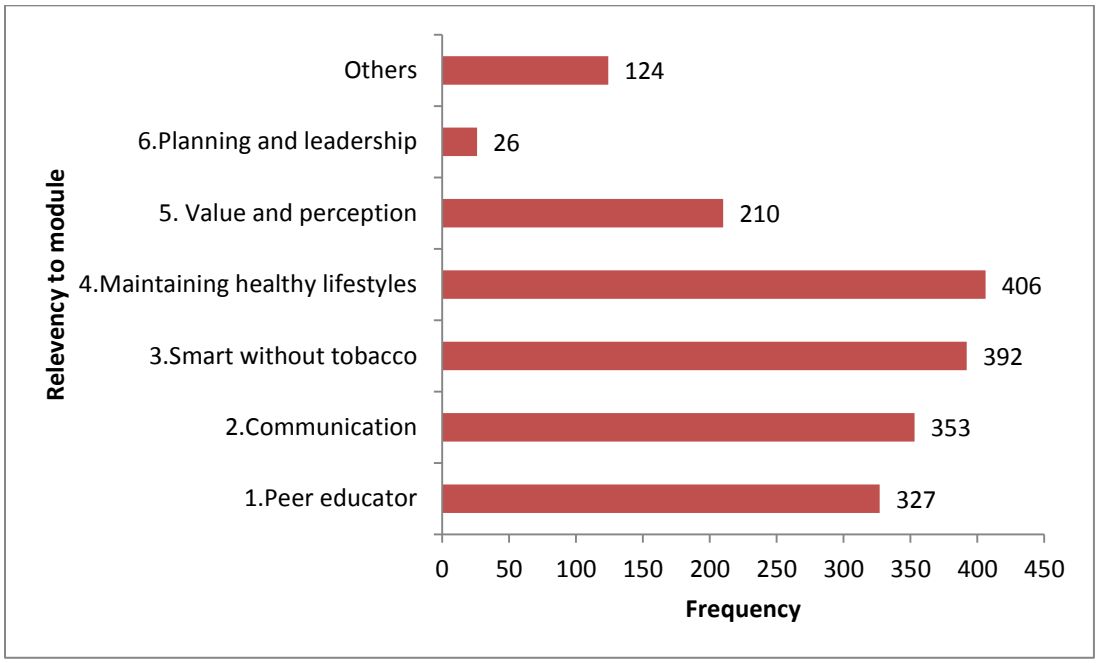
Figure 5.8
Location of the activity of peer educators



5.14.4 Relevancy of the peer educator module to peer educator activities.

Figure 5.9 shows the activities in the peer educator module training programme that were particularly relevant for peer educators. The session on maintaining healthy lifestyles including abstinence from smoking appeared to be the most relevant session in the peer educator training. Other important sessions included the sessions on 'smart without tobacco', 'communication' and 'peer educator'.

Figure 5.9
Relevancy of peer educators' activities to module



5.15 Participants' interaction with friends

In the questionnaire at follow-up, I asked the participants from the eight participating schools about their interaction with friends about smoking issues. Table 5.16 refers to the comparison between intervention and control schools about the participants' interactions with their friends about smoking related issues. More participants from the intervention schools reported having had conversations and discussions about smoking issues with their same-age friends. Conversations about smoking issues were significantly different between intervention and control schools but discussions about the disadvantages of smoking were not significantly different between intervention and contol schools.

Table 5.16

Interaction with friends regarding smoking issues

Interaction with friends	Intervention Schools n=990	Control Schools n=898	Total N=1888	Relative risk (95 % CI) P value
i) Having a conversation about smoking issues with same-age friends				
Yes	428 (43.2%)	339 (37.8%)	769 (40.6%)	1.1452 (1.0257 to 1.2787)
No	562 (56.8%)	559 (62.2%)	1121 (59.4%)	P = 0.0159 (<0.05)*
ii) Having a discussion about disadvantages of smoking with same-age friends				
Yes	622 (62.8%)	532 (59.2%)	1154 (61.1%)	1.0605 (0.9865 to 1.1401)
No	368 (37.2%)	366 (40.8%)	734 (38.9%)	P = 0.1116

*Note: *-significant at 95%CI*

CHAPTER 6

EVALUATION OF THE EFFECTS OF THE INTERVENTION ON SMOKING BEHAVIOUR

6.1 Overview

This chapter describes the analyses that were conducted in order to assess the impact of intervention on the smoking related behaviour of participants. The analyses I conducted were relative risk and chi square analyses which were both at the individual level of the participants and multilevel analyses which took into account the clustering of participants in schools. I considered the influence of uncertainty within the data set by executing the statistical analysis using four data sets.

6.2 Sources of uncertainty

In this study, there were three sources of uncertainty. The first source related to missing values at follow-up for the main smoking behaviour question. The second source focused on within questionnaire inconsistency regarding responses to the smoking behaviour questions in the questionnaires. An example of this type of uncertainty was respondents who answered one smoking behaviour question indicating that they had never smoked but in another smoking behaviour question indicated that they had smoked at least one cigarette in the previous week. The third source of uncertainty focussed on inconsistency between baseline and follow-up answers in relation to smoking behaviour. An example of this type of uncertainty was respondents who reported that at baseline they were ex-smoker, occasional or regular smokers but at follow-up indicated that they had never smoked not even a puff.

6.3 Interpretation of smoking behaviour for analysis

Smoking behaviour in this analysis was classified into four categories: never smokers (NS), ex-smokers/occasional smokers (ES), regular monthly smokers (RMS) and regular weekly smokers (RWS). Never smokers were those participants who stated they had never smoked

not even a puff of cigarette in their life. However, for the purpose of my analyses those participants who had tried to smoke once were also considered as never smokers. Ex-smokers were those participants who used to smoke but had already stopped smoking. Occasional smokers were those participants who only smoked on certain occasions. I combined ex-smokers and occasional smokers into one category because although these young people had smoked or did smoke they did not smoke on a monthly basis. Regular monthly smokers were those participants who reported regularly smoking at least one cigarette every month whereas regular weekly smokers were participants who reported regularly smoking at least one cigarette every week.

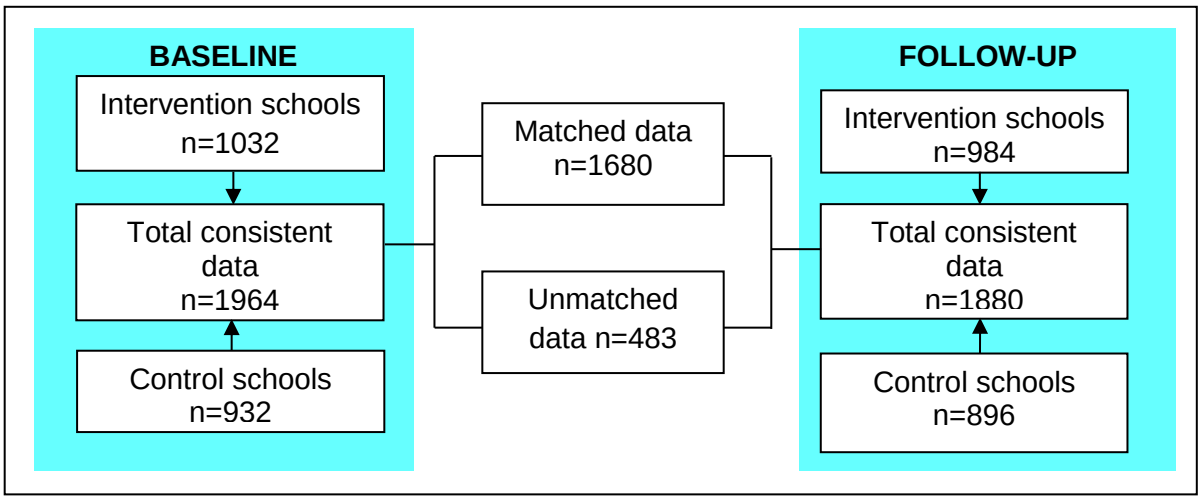
I conducted a sensitivity analysis in order to determine whether the outcomes of the data analysis were influenced by uncertainty within the data set. The main aim of a sensitivity analysis is to provide information on the robustness of the study findings. This analysis was followed by a subgroup analysis which aimed to provide information on whether the influence of the intervention varied according to subgroup e.g. gender. This type of analysis is considered to be a preliminary analysis as the primary analysis that I did that aimed to examine the variable influence of the intervention on subgroups such as boys and girls focussed on an assessment of the significance of the interaction term intervention X gender in the multilevel logistic models that follow.

6.4 Management of missing data

The number of baseline and follow-up participants was 1971 and 1888 respectively. However, I only included 1964 baseline participants and 1880 follow-up participants in my analyses. Seven baseline participants and eight follow-up participants were omitted from the analyses. This was because they provided inconsistent answers to the smoking behaviour questions either within a questionnaire or between questionnaires. In order to evaluate the changes after delivering the intervention, I needed to match the baseline participants to those at follow-up based on their personal identification code. This code was based on a combination of

participants' birthdays and the first three letters of their mothers' name. The number of matched participants was 1680 and there were another 483 questionnaires that were unmatched from baseline and follow-up data. The unmatched questionnaire originated from both the baseline and follow-up data collection points. Figure 6.1 shows the description of data collection.

Figure 6.1
Management of missing data



Two assumptions were made regarding the follow-up smoking behaviour of respondents who had missing values at follow-up. The first assumption was that these participants retained their baseline smoking behaviour at the 7 month follow-up. The second assumption was that these respondents were all regular smokers. The analyses using the overall data set which included everybody regardless of whether they were matched or not and the matched data set were then repeated using data based on these two assumptions.

6.5 Smoking behaviour across my data sets

Table 6.1 describes the proportion of never smokers, ex-smokers/occasional smokers and regular monthly smokers across the data set between intervention and control schools at baseline and at follow-up with and without my first and second assumptions.

The percentage of never smokers remained higher in intervention schools than control schools at baseline and follow-up in all data sets (overall, matched, first assumption, second assumption). However, the proportion of ex-smokers/occasional smokers was lower in intervention schools than control school in each data set. At baseline, the proportion of regular monthly smokers in intervention schools was higher than in control schools but at follow-up, it was lower in intervention schools than control schools.

Table 6.1
Smoking behaviour across the data sets

Data	Smoking status	Baseline			Follow-up		
		Intervention % (n)	Control % (n)	Total	Intervention % (n)	Control % (n)	Total
Overall data	**NS**	83.2 (859)	81.8 (762)	82.5 (1621)	84.2 (829)	79.5 (712)	82.0 (1541)
	ES	11.5 (119)	14.8 (138)	13.1 (257)	12.4 (122)	15.0 (134)	13.6 (256)
	RMS	4.7 (48)	3.3 (31)	4.0 (79)	3.4 (33)	5.6 (50)	4.4 (83)
	No answer	0.6 (6)	0.1 (1)	0.4 (7)	-	-	-
	Total	**1032**	**932**	**1964**	**984**	**896**	**1880**
Matched data	**NS**	87.3 (776)	84.8 (672)	86.1 (1448)	84.8 (754)	80.1 (634)	82.6 (1388)
	ES	9.7 (86)	12.9 (102)	11.2 (188)	12.4 (110)	14.3 (113)	13.3 (223)
	RMS	3.0 (27)	2.3 (18)	2.7 (45)	2.8 (24)	5.7 (45)	4.2 (70)
	Total	**889**	**792**	**1681**	**888**	**792**	**1680**
Data using first assumption (Retained baseline smoking status)	**NS**	83.2 (859)	81.8 (762)	82.5 (1621)	80.9 (912)	77.4 (802)	79.2 (1714)
	ES	11.5 (119)	14.8 (138)	13.1 (257)	13.8 (155)	16.4 (170)	15.0 (325)
	RMS	4.7 (48)	3.3 (31)	4.0 (79)	4.8 (54)	6.1 (63)	5.4 (117)
	No answer	0.6 (6)	0.1 (1)	0.4 (7)	0.5 (6)	0.1 (1)	0.3 (7)
	Total	**1032**	**932**		**1127**	**1036**	**2163**
Data using second assumption (Baseline participants with missing follow-up data were regular smokers at follow-up)	**NS**	83.2 (859)	81.8 (762)	82.5 (1621)	73.6 (829)	68.7 (712)	71.2 (1541)
	ES	11.5 (119)	14.8 (138)	13.1 (257)	10.8 (122)	12.9 (134)	11.8 (256)
	RMS	4.7 (48)	3.3 (31)	4.0 (79)	15.6 (176)	18.3 (190)	16.9 (366)
	No answer	0.6 (6)	0.1 (1)	0.4 (7)	-	-	-
	Total	**1032**	**932**	**1964**	**1127**	**1036**	**2163**

Key
NS = never smokers
ES = ex/occasional smokers
RMS = regular smokers (monthly)

6.6 Impact of intervention and related variables on smoking behaviour using the relative risk analysis method

I calculated the relative risks in order to assess the effectiveness of school-based smoking prevention intervention on a) smoking amongst baseline never smokers and b) stopping smoking amongst baseline ex-smokers/occasional smokers and both monthly and weekly regular smokers. Relative risk analysis examined the influence on participants' smoking status of 1) location of school i.e. district within Sabah, 2) gender 3) staying or not staying in a school hostel during school term and 4) allocation to the intervention and control arms of the study.

The analyses were conducted on overall and matched data at baseline and follow-up and data with first and second assumptions.

6.6.1 Relative risk for smoking status on overall data

Table 6.2 shows the results for the relative risk analyses I conducted using data from participants who were internally consistent in relation to smoking behaviour at baseline (1964 participants) and follow-up (1880 participants). At baseline, participants in intervention schools were significantly less likely to be ex-smokers/occasional smokers but significantly more likely to be regular weekly smokers than in control schools. Respondents who lived in the District of Kota Kinabalu were significantly less likely to be never smokers and significantly more likely to be regular monthly smokers.

At follow-up, students attending intervention schools were significantly more likely to be never smokers but significantly less likely to be regular monthly smokers. Compared with girls, boys were significantly less likely to be never smokers but significantly more likely to be ex-smokers/occasional smokers and regular monthly and weekly smokers.

Table 6.2

Relative risk for smoking status (overall data) by allocation of school, location of school, gender and place to stay during school term

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Allocation of school • Intervention • Control*	1.022 (0.982 to 1.064) p= 0.290	1.060 (1.015 to 1.106) p=0.008**	0.786 (0.626 to 0.989) p=0.040**	0.831 (0.661 to 1.043) p=0.110	1.402 (0.900 to 2.183) p=0.135	0.602 (0.392 to 0.926) p=0.021**	2.089 (1.096 to 3.981) p=0.025**	0.912 (0.522 to 1.595) p=0.747
Location of school • District of K Kinabalu • District of Keningau*	0.951 (0.913 to 0.990) p=0.014**	0.978 (0.937 to 1.020) p=0.306	1.1542 (0.9173 to 1.4523) p=0.221	1.000 (0.796 to 1.256) p=0.100	1.813 (1.149 to 2.862) p=0.011**	1.521 (0.987 to 2.344) p=0.058	1.189 (0.656 to 2.156) p=0.569	1.740 (0.970 to 3.122) p=0.063
Gender • Boy • Girl*	0.726 (0.696 to 0.757) p<0.000**	0.740 (0.708 to 0.774) p<0.000**	7.838 (5.313 to 11.563) p<0.000**	5.794 (4.122 to 8.144) p<0.000**	13.677 (5.553 to 33.685) p<0.000**	4.673 (2.649 to 8.241) p<0.000**	9.010 (3.232 to 25.118) p<0.000**	6.637 (2.835 to 15.537) p<0.000**
Place to stay during school term • School hostel • Not school hostel*	1.044 (0.971 to 1.124) p=0.244	1.058 (0.989 to 1.131) p=0.099	0.983 (0.613 to 1.577) p=0.944	1.006 (0.665 to 1.523) p=0.976	0.189 (0.026 to 1.348) p=0.096	0.067 (0.004 to 1.075) p=0.056	1.168 (0.010 to 2.717) p=0.209	0.115 (0.007 to 1.863) p=0.128

Note:
*:Reference group
**:Significant at 95%CI

6.6.2 Relative risk for smoking status on matched data

The total number of participants who were matched at baseline and follow-up was 1681 participants. Table 6.3 displays relative risks in relation to smoking status for consistent matched data. At baseline, participants in intervention schools were less likely to be ex-smokers/occasional smokers and more likely to be regular smokers than participants in control schools and both of these findings were significant.

As with the overall data set data boys both at baseline and follow-up were found to be significantly less likely to be never smokers and significantly more likely to be ex-smokers/occasional smokers and regular monthly and weekly smokers.

Table 6.3

Relative risk for smoking status (matched data) by allocation of school, location of school, gender and place to stay during school term

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	F/up	Baseline	F/up	Baseline	F/up	Baseline	F/up
	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value	RR 95 % CI P value
Allocation of school • Intervention • Control*	1.029 (0.990 to 1.069) p= 0.151	1.059 (1.013 to 1.108) p=0.011**	0.751 (0.573 to 0.984) p=0.038**	0.867 (0.679 to 1.107) p=0.253	1.336 (0.742 to 2.408) p=0.334	0.495 (0.306 to 0.799) p=0.004**	2.004 (0.876 to 4.585) p=0.099	0.721 (0.383 to 1.357) p=0.311
Location of school • District of K Kinabalu • District of Keningau*	0.970 (0.933 to 1.008) p=0.116	0.974 (0.932 to 1.017) p=0.234	1.119 (0.854 to 1.466) p=0.416	1.023 (0.801 to 1.306) p=0.857	1.710 (0.936 to 3.124) p=0.081	1.596 (0.992 to 2.568) p=0.054	1.101 (0.512 to 2.365) p=0.806	2.044 (1.038 to 4.024) p=0.039**
Gender • Boy • Girl*	0.769 (0.739 to 0.802) p<0.000**	0.736 (0.702 to 0.771) p<0.000**	8.511 (5.407 to 13.396) p<0.000**	6.047 (4.211 to 8.685) p<0.000**	14.184 (4.414 to 45.584) p<0.000**	6.079 (3.134 to 11.792) p<0.000**	12.158 (2.883 to 51.282) p=0.001**	18.685 (4.513 to 77.351) p=0.000**
Place to stay during school term • School hostel • Not school hostel*	1.016 (0.944 to 1.093) p=0.681	1.057 (0.986 to 1.132) p=0.117	1.051 (0.619 to 1.784) p=0.855	0.990 (0.632 to 1.550) p=0.964	0.322 (0.048 to 2.312) p=0.260	0.079 (0.005 to 1.275) p=0.074	0.265 (0.016 to 4.314) p=0.351	0.145 (0.009 to 2.354) p=0.175

Note:
*:Reference group
**:Significant at 95%CI

6.6.3 Relative risk for smoking status using data based on the first assumption

The total number of internally consistent participants at follow-up in data with first assumption was 2163 participants. This figure is composed of 1964 baseline participants and an additional 199 follow-up participants who could not be matched to baseline participants. Table 6.4 shows the results for relative risk at follow-up on smoking status by variables in which missing participants were assumed to retain their baseline smoking status.

Respondents in intervention schools were significantly more likely to be never smokers at follow-up than respondents attending control schools. Participants from the District of Kota Kinabalu were significantly more likely to be regular monthly smokers at follow-up compared with participants from the District of Keningau. Interestingly, participants who stayed in a school hostel during term time were significantly more likely to be never smokers and significantly less likely to regular monthly smokers.

Boys were again significantly less likely to be never smokers and significantly more likely to be ex-smokers/occasional smokers, regular smokers (monthly & weekly).

Table 6.4

Relative risk for smoking status (data with first assumption) by allocation of school, location of school, gender and place to stay during school term

	Never smokers	Ex-smokers/occasional smokers	Regular smokers (monthly)	Regular smoker (weekly)
	F/up	F/up	F/up	F/up
	RR (95 % CI) P value	RR (95 % CI) P value	RR (95 % CI) P value	RR (95 % CI) P value
Allocation of school • Intervention • Control*	1.049 (1.004 to 1.095) P = 0.031**	0.846 (0.692 to 1.035) P = 0.104	0.791 (0.556 to 1.127) P = 0.194	1.146 (0.708 to 1.855) P = 0.580
Location of school • District of K Kinabalu • District of Keningau*	0.959 (0.918 to 1.001) P = 0.055	1.050 (0.859 to 1.283) P = 0.636	1.636 (1.135 to 2.360) P = 0.008**	1.624 (0.989 to 2.669) P = 0.056
Gender • Boy • Girl*	0.707 (0.677 to 0.739) P < 0.000**	5.746 (4.216 to 7.831) P < 0.000**	5.550 (3.298 to 9.342) P < 0.000**	6.265 (3.004 to 13.067) P < 0.000**
Place to stay during school term • School hostel • Not school hostel*	1.082 1.012 to 1.157) P = 0.021**	0.962 (0.655 to 1.412) P = 0.841	0.051 (0.003 to 0.814) P = 0.035**	0.091 (0.006 to 1.467) P = 0.091

Note:
*:Reference group
**:Significant at 95%CI

6.6.4 Relative risk for smoking status using data based on the second assumption

The total number of internally consistent participants at follow-up in data with second assumption was 2163 participants. This figure is again composed of 1964 baseline participants and an additional 199 follow-up participants who could not be matched to baseline participants. Table 6.5 describes the results for the relative risks at follow-up of different smoking statuses in which missing baseline participants who could not be matched to follow-up participants were assumed to be regular monthly smokers.

Students attending intervention schools were significantly more likely to be never smokers at follow-up. Students who attended schools in the District of Kota Kinabalu were significantly more likely to be regular weekly smokers. Students were significantly more likely to be ex-smokers/occasional smokers if they did not stay in the school hostel. However, students who did stay in the school hostel during term time were significantly more likely to be never smokers and significantly less likely to be regular monthly and regular weekly smokers.

Again boys were significantly less likely to be never smokers and significantly more likely to be ex-smokers/occasional smokers, regular smokers (monthly & weekly).

Table 6.5

Relative risk for smoking status (data with second assumption) by allocation of school, location of school, gender and place to stay during school term

	Never smokers F/up RR 95 % CI P value	Ex-smokers/occasional smokers F/up RR 95 % CI P value	Regular smokers (monthly) F/up RR 95 % CI P value	Regular smoker (weekly) F/up RR 95 % CI P value
Allocation of school • Intervention • Control*	1.068 (1.012 to 1.127) P = 0.018**	0.837 (0.665 to 1.053) P = 0.129	0.860 (0.713 to 1.038) P = 0.116	1.088 (0.622 to 1.904) P = 0.767
Location of school • District of K Kinabalu • District of Keningau*	0.976 (0.925 to 1.029) P = 0.370	0.998 (0.793 to 1.256) P = 0.984	1.112 (0.920 to 1.342) P = 0.272	1.736 (0.967 to 3.117) P = 0.065
Gender • Boy • Girl*	0.684 (0.647 to 0.722) P < 0.000**	5.350 (3.800 to 7.533) P < 0.000**	2.087 (1.692 to 2.572) P < 0.000**	6.129 (2.616 to 14.357) P < 0.000**
Place to stay during school term • School hostel • Not school hostel*	1.133 (1.044 to 1.229) P = 0.003**	1.078 (0.710 to 1.636) P = 0.725	0.414 (0.238 to 0.719) P = 0.002**	0.003 (0.000 to 0.052) P = 0.000**

Note:
*:Reference group
**:Significant at 95%CI

6.7 Impact of the intervention on subgroup of risk factors of smoking behaviour

In the subgroup analyses, I divided the participants into subgroups to determine the effect of the intervention on different subgroups. These analyses were conducted on three factors that may influence the smoking behaviour of participants namely district in which the school was located, gender and staying or not staying in the school hostel during school term. These analyses were repeated using the overall data set, the matched data set at baseline and follow-up and data sets that were based on the first and second assumptions.

6.7.1 Subgroup analysis by District

As noted in Chapter 2 the District of Kota Kinabalu is an urban area whereas the District of Keningau is composed of suburban and rural areas.

i) District of Kota Kinabalu

Table 6.6 displays the results for the relative risk analysis of smoking behaviour among participants in the District of Kota Kinabalu. When each of the four data sets were used, students at baseline attending the intervention schools were significantly more likely to be never smokers and significantly more likely to be ex-smokers. The likelihood of being a regular monthly or regular weekly smoker was not significantly different across the intervention and control schools. At follow-up, being a never smoker was significantly more likely in the intervention schools when each of the four different data sets was used. Being an ex-smoker was significantly less likely in the intervention schools when the overall matched data set, and data sets with both the first and second assumptions were used. However, when the matched data sets were used there was no significant difference between intervention and control schools regarding ex-smoker status. In relation to regular smoking, the only observed significant difference occurred when the matched data set was used and the smoking status was regular monthly smoking. Students were significantly less likely to be regular monthly smokers if they attended the intervention schools.

Table 6.6

Subgroup analysis by location: District of Kota Kinabalu

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Overall data Allocation of school • Intervention • Control*	1.0735 1.0085 to 1.1427 P = 0.0260**	1.0960 1.0283 to 1.1682 P = 0.0049**	0.6082 0.4471 to 0.8274 P = 0.0015**	0.7193 0.5233 to 0.9887 P = 0.0423**	1.3079 0.7542 to 2.2681 P = 0.3392	0.5889 (0.3435 to 1.0099) P = 0.0543	2.8616 1.0770 to 7.6033 P = 0.0350**	0.8281 (0.4142 to 1.6556) P = 0.5936
Matched data Allocation of school • Intervention • Control*	1.0743 1.0127 to 1.1396 P = 0.0173**	1.0938 1.0233 to 1.1692 P = 0.0084**	0.5697 0.3943 to 0.8232 P = 0.0027**	0.7510 0.5355 to 1.0532 P = 0.0970	1.2289 0.5876 to 2.5704 P = 0.5840	0.5199 0.2895 to 0.9339 P = 0.0286**	1.8775 0.5935 to 5.9397 P = 0.2837	0.7510 0.3523 to 1.6009 P = 0.4584
Data using first assumption Allocation of school • Intervention • Control*	-	1.0918 1.0229 to 1.1654 P = 0.0083**	-	0.7221 0.5477 to 0.9519 P = 0.0209**	-	0.7749 0.4991 to 1.2031 P = 0.2559	-	1.2108 0.6539 to 2.2421 P = 0.5428
Data using second assumption Allocation of school • Intervention • Control*	-	1.0928 1.0100 to 1.1823 P = 0.0273**	-	0.7171 0.5200 to 0.9891 P = 0.0427**	-	0.8834 0.6856 to 1.1382 P = 0.3377	-	0.8256 0.4123 to 1.6532 P = 0.5886

Note:
*:Reference group
**:Significant at 95%CI

ii) District of Keningau

Table 6.7 shows the relative risk analysis of smoking related behaviour among participants who attended school in the District of Keningau. The only significant finding was when the matched data set was used. In these data students were significantly less likely to be a monthly smoker at follow-up if they attended an intervention school rather than a control school.

Table 6.7

Subgroup analysis by location: District of Keningau

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Overall data Allocation of school • Intervention • Control*	0.9850 (0.9334 to 1.0394) P = 0.5814	1.0303 (0.9717 to 1.0925) P = 0.3180	1.0306 (0.7327 to 1.4496) P = 0.8625	0.9605 (0.6930 to 1.3313) P = 0.8090	1.3803 (0.6531 to 2.9172) P = 0.3986	0.5628 (0.2745 to 1.1539) P = 0.1166	1.5183 (0.6162 to 3.7410) P = 0.3641	0.9551 (0.3718 to 2.4538) P = 0.9240
Matched data Allocation of school • Intervention • Control*	0.9909 0.9408 to 1.0438 P = 0.7310	1.0320 0.9715 to 1.0963 P = 0.3065	1.0174 0.6820 to 1.5176 P = 0.9327	1.0077 0.7077 to 1.4348 P = 0.9661	1.3703 0.5153 to 3.6445 P = 0.5278	0.3927 0.1669 to 0.9239 P = 0.0323*	2.1316 0.6470 to 7.0235 P = 0.2134	0.5329 0.1617 to 1.7559 P = 0.3009
Data using first assumption Allocation of school • Intervention • Control*	-	1.0186 0.9610 to 1.0795 P = 0.5352	-	0.9866 0.7373 to 1.3201 P = 0.9276	-	0.7246 0.3980 to 1.3193 P = 0.2920	-	0.9377 0.4240 to 2.0740 P = 0.8738
Data using second assumption Allocation of school • Intervention • Control*	-	1.0542 0.9782 to 1.1360 P = 0.1666	-	0.9828 0.7067 to 1.3667 P = 0.9179	-	0.7965 0.6016 to 1.0545 P = 0.1120	-	0.9772 0.3799 to 2.5135 P = 0.9619

Note:
*:Reference group
**:Significant at 95%CI

6.7.2 Subgroup analysis by gender

Most of the missing and unmatched participants at follow-up were boys. Hence, in three sets of data the majority of participants were boys. The exception was the matched data set.

i) Boy

Table 6.8 shows the results of the relative risk analysis for boys who reported being a never smoker, an ex-/occasional smoker, a regular monthly smoker and a regular weekly smoker. At baseline boys were significantly more likely to report they were regular weekly smokers if they attended an intervention school and the overall data set was used.

At follow-up, when the overall data set and the matched data set were used, boys were significantly less likely to be monthly regular smokers if they attended an intervention school.

ii) Girl

Table 6.9 indicates the results for the relative risk analysis of the various smoking related behaviours for girls. When the four different data sets were used, the relative risk of being a never smoker, an ex-/occasional smoker, a regular monthly smoker or a regular weekly smoker did not vary significantly across the intervention and control schools.

Table 6.8

Subgroup analysis by gender: boy

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Overall data Allocation of school • Intervention • Control*	1.0156 0.9373 to 1.1005) P = 0.7056	1.0863 (1.0000 to 1.1801) P = 0.0499**	0.8552 (0.6802 to 1.0752) P = 0.1804	0.9120 (0.7226 to 1.1510) P = 0.4378	1.4008 (0.8976 to 2.1862) P = 0.1377	0.5886 (0.3663 to 0.9459) P = 0.0285**	2.0198 (1.0499 to 3.8857) P = 0.0352**	0.9418 0.5209 to 1.7027 P = 0.8426
Matched data Allocation of school • Intervention • Control*	1.0333 0.9552 to 1.1178 P = 0.4141	1.0890 0.9962 to 1.1905 P = 0.0606	0.8201 0.6246 to 1.0767 P = 0.1533	0.9450 0.7365 to 1.2126 P = 0.6565	1.3559 0.7472 to 2.4604 P = 0.3166	0.5085 0.3025 to 0.8547 P = 0.0107**	2.0338 0.8800 to 4.7007 P = 0.0967	0.8135 0.4276 to 1.5479 P = 0.5295
Data using first assumption Allocation of school • Intervention • Control*	-	1.0623 0.9785 to 1.1533 P = 0.1496	-	0.9225 0.7527 to 1.1307 P = 0.4374	-	0.7925 0.5442 to 1.1540 P = 0.2251	-	1.1407 0.6871 to 1.8935 P = 0.6108
Data using second assumption Allocation of school • Intervention • Control*	-	1.0689 0.9700 to 1.1780 P = 0.1788	-	0.8974 0.7071 to 1.1388 P = 0.3729	-	0.9204 0.7410 to 1.1434 P = 0.4538	-	0.9267 0.5114 to 1.6791 P = 0.8017

Note:
*:Reference group
**:Significant at 95%CI

Table 6.9

Subgroup analysis by gender: girl

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Overall data Allocation of school • Intervention • Control*	0.9944 0.9708 to 1.0185 P = 0.6455	1.0039 0.9727 to 1.0360 P = 0.8109	0.8657 0.4114 to 1.8214 P = 0.7039	0.8910 0.4693 to 1.6918 P = 0.7243	8.8464 0.4905 to 159.5360 P = 0.1396	1.0630 0.3718 to 3.0390 P = 0.9093	7.2380 0.3908 to 134.0629 P = 0.1838	1.5945 0.2935 to 8.6619 P = 0.5890
Matched data Allocation of school • Intervention • Control*	0.9947 0.9726 to 1.0172 P = 0.6396	1.0029 0.9722 to 1.0347 P = 0.8533	0.9546 0.3998 to 2.2796 P = 0.9167	1.0042 0.5062 to 1.9923 P = 0.9904	5.4706 0.2834 to 105.5856 P = 0.2605	0.7811 0.2278 to 2.6779 P = 0.6943	3.9076 0.1882 to 81.1502 P = 0.3785	0.7811 0.0490 to 12.4462 P = 0.8611
Data using first assumption Allocation of school • Intervention • Control*	-	1.0020 0.9713 to 1.0336 P = 0.9004	-	0.8563 0.4771 to 1.5369 P = 0.6031	-	1.3623 0.4989 to 3.7197 P = 0.5464	-	2.4521 0.4973 to 12.0907 P = 0.2705
Data using second assumption Allocation of school • Intervention • Control*	-	1.0273 0.9762 to 1.0812 P = 0.3009	-	0.9119 0.4796 to 1.7336 P = 0.7784	-	0.8313 0.5811 to 1.1892 P = 0.3117	-	1.6318 0.3002 to 8.8686 P = 0.5708

Note:
*:Reference group
**:Significant at 95%CI

6.7.3 Subgroup analysis regarding staying or not staying in the school hostel during school term

Five of the eight participating schools provided school hostel accommodation for students.

i) Staying in the school hostel

Table 6.10 displays the results of the relative risk analysis for the smoking related behaviour of participants who stayed in the school hostel during school term. Irrespective of which data set was used there appeared to be no significant differences between intervention and control schools in the proportions of never smokers, ex-smokers/occasional smokers and regular monthly and regular weekly smokers

ii) Not staying in the school hostel

Table 6.11 shows the results of the relative risk analysis on smoking related behaviour for participants who did not stay in the school hostel during school term. At baseline, when both the overall data set and the matched data set were used, students were significantly less likely to be ex-smokers if they attended the intervention schools. When the overall data set was used students were significantly more likely to report that they were regular weekly smokers if they attended the intervention schools. In addition, students who did not stay in the school hostel were significantly more likely to be regular weekly smokers in intervention schools than in control schools when the overall data was used but not when the other data sets were used.

At follow-up those students who did not stay in the school hostel were significantly more likely to be never smokers in the intervention schools than in control schools in all four data sets. Additionally, when the overall data set, matched data set and data set based on the second assumption were used, the likelihood of being a regular monthly smoker was significantly less in intervention schools.

Table 6.10

Subgroup analysis by place to stay during school term: Staying in the school hostel

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR 95 % CI P value	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**	**RR 95 % CI P value**
Overall data Allocation of school • Intervention • Control*	0.9890 0.8557 to 1.1430 P = 0.8810	1.0226 0.8994 to 1.1627 P = 0.7331	0.9184 0.3566 to 2.3650 P = 0.8599	0.8661 (0.3718 to 2.0174) P = 0.7389	4.5600 0.1895 to 109.730 6 P = 0.3498	1.7193 0.0346 to 85.4812 P = 0.7857	1.5200 0.0307 to 75.3715 P = 0.8335	1.7193 0.0346 to 85.4812 P = 0.7857
Matched data Allocation of school • Intervention • Control*	0.9696 0.8344 to 1.1266 P = 0.6865	0.9940 0.8685 to 1.1376 P = 0.9306	1.0268 0.3595 to 2.9326 P = 0.9606	1.0402 0.4303 to 2.5143 P = 0.9302	4.8837 0.2035 to 117.2097 P = 0.3280	1.6226 0.0327 to 80.5666 P = 0.8080	1.6279 0.0329 to 80.5483 P = 0.8066	1.6226 0.0327 to 80.5666 P = 0.8080
Data using first assumption Allocation of school • Intervention • Control*	-	1.0311 0.9085 to 1.1704 P = 0.6350	-	0.8306 0.3777 to 1.8267 P = 0.6444	-	1.6508 0.0332 to 82.1664 P = 0.8015	-	1.6508 0.0332 to 82.1664 P = 0.8015
Data using second assumption Allocation of school • Intervention • Control*	-	0.9808 0.8362 to 1.1503 P = 0.8113	-	0.8306 0.3547 to 1.9451 P = 0.6691	-	1.6613 0.5603 to 4.9257 P = 0.3600	-	1.6508 0.0332 to 82.1664 P = 0.8015

Note:
*:Reference group
**:Significant at 95%CI

Table 6.11

Subgroup analysis by place to stay during school term: Not staying in the school hostel

	Never smokers		Ex-smokers/occasional smokers		Regular smokers (monthly)		Regular smoker (weekly)	
	Baseline	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**	**Baseline**	**F/up**
	RR **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**	**RR** **95 % CI** **P value**
Overall data Allocation of school • Intervention • Control*	1.0270 0.9844 to 1.0714 P = 0.2177	1.0677 1.0200 to 1.1176 P = 0.0049**	0.7735 0.6110 to 0.9791 P = 0.0327**	0.8251 0.6506 to 1.0465 P = 0.1129	1.3284 0.8520 to 2.0711 P = 0.2102	0.5683 0.3699 to 0.8729 P = 0.0099**	2.0219 1.0615 to 3.8511 P = 0.0322**	0.8610 0.4929 to 1.5041 P = 0.5990
Matched data Allocation of school • Intervention • Control*	1.0338 0.9929 to 1.0764 P = 0.1063	1.0694 1.0198 to 1.1214 P = 0.0056**	0.7355 0.5559 to 0.9733 P = 0.0316**	0.8530 0.6611 to 1.1005 P = 0.2212	1.2330 0.6816 to 2.2304 P = 0.4886	0.4693 0.2908 to 0.7573 P = 0.0019**	1.9206 0.8401 to 4.3909 P = 0.1219	0.6838 0.3636 to 1.2859 P = 0.2382
Data using first assumption Allocation of school • Intervention • Control*	-	1.0561 1.0088 to 1.1056 P = 0.0196**	-	0.8401 0.6822 to 1.0345 P = 0.1008	-	0.7544 0.5302 to 1.0733 P = 0.1172	-	1.0925 0.6753 to 1.7675 P = 0.7185
Data using second assumption Allocation of school • Intervention • Control*	-	1.0864 1.0256 to 1.1507 P = 0.0048**	-	0.8396 0.6603 to 1.0675 P = 0.1536	-	0.8094 0.6700 to 0.9779 P = 0.0284**	-	0.8761 0.5009 to 1.5321 P = 0.6426

Note:
*:Reference group
**:Significant at 95%CI

6.8 Impact of the intervention on baseline smoking behaviour at follow-up using chi-square analysis

I then performed chi-square analyses to determine the relationship between smoking status and the allocation of school to the intervention and control arms of my study. I anticipated and hoped that these analyses would provide further information on the impact of the intervention on baseline smoking behaviour at follow-up. I excluded the category of regular weekly smokers because it was too small to be able to carry out significance testing.

Table 6.12 shows the changes in baseline never smokers at follow-up for matched data and data that had the first and second assumptions. In relation to the matched data, a total of 60 participants who had been never smokers at baseline, took up smoking between baseline and follow-up. In addition, 97% of baseline never smokers remained never smokers in the intervention schools compared with only 94% in control schools. A chi-square test for independence (with Pearson chi-square) indicated a significant association between smoking status and allocation of school to intervention and control schools, χ^2 (2, n=1448) =7.36, p=0.025. The proportion of the various smoking statuses in intervention schools was significantly different from the equivalent proportions in control schools. To determine the effect size, I referred to the Cramer's V statistic with three categories which indicated the effect size was small (Cramer's V=0.071).

Similar results were obtained when I used the data sets with the first and second assumption even though these assumptions resulted in different proportions of students being assigned to the various smoking status categories. .

Table 6.12

Change in smoking behaviour among baseline never smokers at follow-up

	Smoking status	Intervention schools % (n)	Control schools % (n)	Chi-square tests			Symmetric Measures
				χ^2	df	P value	Cramer's V
Matched data	Never smokers	97.2 (754)	94.3(634)	7.360	2	0.025**	0.071
	Ex-smokers/ occasional smokers	2.2 (17)	4.6 (31)				
	Regular monthly smokers	0.6 (5)	1.0 (7)				
Data using first assumption	Never smokers	97.4 (837)	95.0 (723)	6.844	2	0.033**	0.065
	Ex-smokers/ occasional smokers	2.0 (17)	4.1 (31)				
	Regular monthly smokers	0.6 (5)	0.9 (7)				
Data using second assumption	Never smokers	87.8 (754)	83.2 (634)	9.182	2	0.010**	0.075
	Ex-smokers/ occasional smokers	2.0 (17)	4.1 (31)				
	Regular monthly smokers	10.2 (88)	12.7 (98)				

**: significant at 95%CI

Table 6.13 displays the changes in smoking behaviour among participants who were ex-smokers/occasional smokers at baseline. When the matched data set and the data set with the first assumption were used, significant differences were observed between intervention and control schools in the proportions of baseline ex-smokers/occasional smokers who became regular smokers at follow-up in relation to the matched data, 13% of baseline ex-smokers/occasional smokers in intervention schools had started smoking again compared to 28% of the control schools. A chi-square test for independence (with Yates continuity correction) indicated that baseline ex-smokers/occasional smokers were significantly less likely to be regular monthly smokers at follow-up if they attended an intervention school, χ^2

(1, n=188)=5.913, p=0.015. To determine the effect size, I referred to the phi statistic which indicated the effect size was small (phi=-0.190).

Table 6.13

Change in smoking behaviour among baseline ex-smokers/occasional smokers at follow-up

	Smoking status	Intervention schools % (n)	Control schools % (n)	Chi-square tests			Symmetric Measures
				χ^2	df	P value	Phi
Matched data	Ex-smokers/ occasional smokers	87.2 (75)	71.6 (73)	5.913	1	0.015**	-0.190
	Regular monthly smokers	12.8 (11)	28.4 (29)				
Data using first assumption	Ex-smokers/ occasional smokers	90.8 (108)	79.0 (109)	5.871	1	0.015**	0.162
	Regular monthly smokers	9.2 (11)	21.0 (29)				
Data using second assumption	Ex-smokers/ occasional smokers	63.0 (75)	52.9 (73)	2.284	1	0.131	0.102
	Regular monthly smokers	37.0 (44)	47.1 (65)				

**: significant at 95%CI

Table 6.14 shows the changes in smoking behaviour among participants who were regular monthly smokers at baseline. The results indicate that attending an intervention school had no significant influence on the follow-up smoking status of baseline regular monthly smokers irrespective of which data set was used.

Table 6.14

Change in smoking behaviour among baseline regular monthly smokers at follow-up

	Smoking status	Intervention schools % (n)	Control schools % (n)	Chi-square tests			Symmetric Measures
				χ^2	df	P value	Cramer's V
Matched data	Ex-smokers/ occasional smokers	66.7 (18)	50.0 (8)	0.574	1	0.449	0.165
	Regular monthly smokers	33.3 (9)	50.0 (8)				
Data using first assumption	Ex-smokers/ occasional smokers	37.5 (18)	27.6 (8)	0.413	1	0.520	0.102
	Regular monthly smokers	62.5 (30)	72.4 (21)				
Data using second assumption	Ex-smokers/ occasional smokers	37.5 (18)	27.6 (8)	0.413	1	0.520	0.102
	Regular monthly smokers	62.5 (30)	72.4 (21)				

6.9 Assessing the effects of the intervention using multilevel analysis

Multilevel analysis was used in this study to account for the randomization of clusters rather than individuals in the allocation of schools to the intervention and control arms of my study. This study has two levels, level 1 consists of the individual level predictors and level 2 consists of the level two predictors arising from clustering of participants in schools and in districts. I conducted multilevel logistic regression statistical analysis with binary outcomes to consider the structure design and the potential variability between clusters which in my case refers to clusters of students within schools (Heck, Thomas & Tabata, 2012; Healy, 2001)

I carried out three different types of multilevel analysis to assess the effects of the intervention on participants. The first analysis assessed the effects of the intervention on matched participants using multilevel analysis with random intercepts. The second analysis assessed the effects of the intervention on participants who were selected according to

baseline smoking status using multilevel analysis with random intercepts. The third analysis assessed the effects of the intervention on matched participants using multilevel analysis with random intercept and random slope. These analyses were carried out using three data sets, the matched data set, the data set that had used the first assumption (baseline participants missing at follow-up retained their baseline smoking status at follow-up) and the data set that had used the second assumption (baseline participants who were missing at follow-up were classified as regular smokers at follow-up). The outcomes from these analyses were never smokers, ex-smokers/occasional smokers and regular smokers (monthly). In the multi-level analyses, the outcome and predictors were dichotomous factors.

6.9.1 Assessing the effects of the intervention on matched participants using multilevel analysis with random intercept.

The analysis plan for matched participants using multilevel models with random intercepts started with the null model. The null model is an analysis to investigate the variation of smoking status outcomes across schools without the variables from the level 1 (individual) and level 2 (school). In the null model, covariance parameters provide information on the fixed and random effects including the number of units in level 2 for all smoking status outcomes. It was confirmed that the required estimation for each fixed and random effect was one parameter. The number of level 2 units was also summarized in common subjects as 8 schools. The intercept in the null model is a predictor of the odds that a student's smoking status of never smoking at follow-up has a standing of 0 on the other predictors when the random effect constant is held at 0.

The null model produced the estimated log odds and the odds ratio was obtained by exponentiating the log odds coefficient. When the log odds of the intercept predictor were converted to the average school-level probability, it estimated the probability of students' smoking status at follow-up. The estimated probability represented the average school-level

outcome as opposed to the average individual outcome. In addition, I conducted a single level analysis as a comparison with the multilevel (two-level) analysis to estimate the probability of smoking status without predictors. The variance components indicated the existence of variation between schools. The variation between schools was determined by the intra class correlation (ICC).

Then I added the variables from level 1 to predict changes in the fixed effects. The common subjects indicated the number of individual students being included in the analyses. The design matrix showed the number of level-1 predictors in the fixed effects. The group estimation for all the predictors was coded as 1 and the reference parameters were 0 because they were redundant.

The analysis was continued by adding the school level variables together with variables in level-1 as the results might explain the variability in school intercepts. The design matrix showed the number of the level-2 predictors being included together with the level-1 predictors in the fixed effects. Both school level variables were nominal data. All three analyses which were analysis with random intercepts, analysis of subgroups based on baseline smoking status with random intercepts and analysis of the whole data set with random intercepts and random slopes were conducted using 1) the matched data set 2) the matched data set based on the first assumption and 3) the matched data set based on the second assumption.

6.9.1.1 Matched data random intercept

In the matched data set, there were 1680 individual students.

a) Outcome : Never smokers at follow-up

Null model

The estimated log odds were 1.624 (SE=0.143, t=11.360, p<0.001). The odds ratio was 5.074 ($2.71828^{1.624}$). This odds ratio suggested that students were about 5 times more likely to be never smokers than ever smokers in the follow-up within the average school.

The probability of students' smoking status of never smokers at follow-up was estimated as $[1/ (1+e^{-(1.624)})]$ or 0.8353 (83.5%). The estimated probability was slightly larger than the probability in the single level analysis without predictors (82.7%).

The variance components showed that the z-test (z=0.150) was not significant and indicated that the intercept variance did not vary between schools. The intra class correlation (ICC) was calculated as 0.0436 which means that approximately only 4.4% of the variability in being categorised as a never smokers at follow-up arose because of variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the five predictors (boy, stay in hostel (hostel), smoking status of parents (SS_parents), smoking status of siblings (SS_siblings) and never smoked at baseline (NS_B).

The fixed-effect output showed that the outcome of never smokers at follow-up was significantly related to the intercept, being a boy and being a never smoker at baseline (NS_B). Boys were significantly more likely to be regular smokers at follow-up as indicated by the negative coefficient. Being a boy reduced the log odds of students who were never smokers at follow-up by 0.603 units (β=-0.603), holding the other effects at constant.

Exponentiating the log odds resulted in an odds ratio of 0.547. Thus, the odds for a boy being a never smoker at follow-up were decreased by about 45.3% compared with girls. Alternatively, boys were about 1.8 times more likely to be ever smokers than girls.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the seven predictors (boy, hostel, SS_parents, SS_sibling, NS_B, allocation of school to intervention or control and location of schools in relation to district). The final fixed-effect output for the outcome of being a never smoker at follow-up is presented in Table 6.15. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significant and therefore did not significantly affect the probability of being a never smoker at follow-up.

Table 6.15

Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome of never smoker at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-2.728	0.200	-13.671	0.00*	0.065
Intervention=1	0.310	0.181	1.709	0.088	1.364
KKinabalu=1	0.027	0.185	0.146	0.884	1.027
Boy=1	-0.583	0.190	-3.069	0.002*	0.558
Hostel=1	-0.142	0.381	-0.374	0.709	0.867
SS_parents=1	-0.310	0.182	-1.704	0.089	0.733
SS_sibling=1	-0.216	0.223	-0.970	0.332	0.806
NS_B=1	6.093	0.126	48.488	0.000*	442.566

Note: Probability distribution:Binomial; Link function:logit

b) Outcome : Ex-smokers/occasional smokers at follow-up

Null model

The estimated log odds were -1.933 (SE=0.130, t=-14.854, p<0.001). The odds were 0.145. This odds ratio suggested that within the average school, students were less likely to be ex-smoker/occasional smokers at follow-up.

The probability of students' smoking status being that of ex-smoker/occasional smoker at follow-up was estimated as 0.1447 (14.5%). The estimated probability was slightly larger than the probability in the single level analysis without predictors (13.2%).

The variance components showed that the z-test (z=0.110) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0323. Thus, approximately only 3.2% of the variability in being categorised as an ex-smoker/occasional smoker at follow-up arose as a consequence of variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ex-smoker/occasional smoker at baseline (ES_B).

The fixed-effect output showed that the outcome of ex-smoker/occasional smokers at follow-up was significantly related to gender (being a boy) and baseline smoking status of never smoker and baseline smoking status of ex-smoker/occasional smoker. Boys were significantly and positively related to the probability of being an ex-smoker/occasional smoker at follow-up compared with girls. Being a boy increased the log odds of students who were categorised as ex-smokers/occasional smokers at follow-up by 0.494 units (β= 0.494), holding the other effects at constant. Exponentiating the log odds resulted in an odds ratio of 0.1638. Compared with girls, the odds for a boy of being an ex-smoker/occasional smoker at follow-up were increased by about 62.1%. Thus, the odds of being an ex-smoker/occasional smoker at follow-up were about 1.6 times higher for boys than girls.

Compared with non-never smokers at baseline, the log odds of being an ex-smoker/occasional smoker at follow-up for baseline never smokers were decreased by 3.150 units (β=-3.150) holding the other effects at constant. The odds of being an ex-

smoker/occasional smoker at follow-up were about 25 times more likely for ever smokers than never smokers at baseline.

While never smokers at baseline were negatively related to the smoking status of ex-smoker/occasional smoker at follow-up, being an ex-smoker/occasional smoker at baseline was positively related to being an ex-smoker/occasional smoker at follow-up. The log odds of ex-smokers/occasional smokers at baseline staying the same at follow-up were increased by 0.899 units (β= 0.899), holding the other predictors at constant. The odds ratio for ex-smokers/occasional smokers at baseline remaining the same at follow-up was 2.5 times more likely than non ex-smokers/occasional smokers at baseline being ex-smokers/occasional smokers at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors(boy, hostel, SS_parents, SS_sibling, NS_B, ES_B, allocation of school and location of schools).

The final fixed-effect output for the outcome of ex-smoker/occasional smoker at follow-up is presented in Table 6.16. The results show that the estimators for level-1 predictors remained about the same. Both school level variables were not significant and therefore did not significantly affect the probability of being an ex-smoker/occasional smoker at follow-up.

Table 6.16
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome of ex-smoker/occasional smoker at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-0.174	0.423	-0.412	0.681	0.840
Intervention=1	0.052	0.173	0.303	0.762	1.054
KKinabalu=1	-0.162	0.177	-0.915	0.361	0.850
Boy=1	0.506	0.189	2.679	0.007	1.659
Hostel=1	0.353	0.299	1.180	0.238	1.423
SS_parents=1	0.279	0.172	1.621	0.105	1.322
SS_sibling=1	0.068	0.213	0.317	0.751	1.070
NS_B=1	-3.166	0.356	-8.903	0.00	0.042
ES_B=1	0.898	0.368	2.437	0.015	2.454

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smoking (monthly) at follow-up

Null model

The estimated log odds were -3.218 (SE=0.198, t=-16.263, p<0.001). The odds ratio was 0.040. This odds ratio suggested that students were less likely to be regular smokers (monthly) at follow-up within the average school. The probability of students' smoking status being monthly regular smokers at follow-up was estimated as $[1/ (1+e^{-(3.218)})]$ or 0.0400 (4.0%). The estimated probability was similar to the probability that was obtained in the single level analysis without predictors (4.1%).

The variance components, the z-test (z=0.224) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0637 which indicated that approximately only 6.4% of variability among regular smokers (monthly) at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the five predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B). The fixed-effect output showed that the outcome of regular

smokers (monthly) at follow-up was significantly related to baseline smoking status of never smoker and ex-smokes/occasional smoker. Both baseline never smokers and baseline ex-smokers/occasional smokers were negatively related to being classified as a monthly regular smoker at follow-up.

The log odds of being a monthly regular smoker at follow-up for baseline never smokers were decreased by 2.878 units (β=-2.878) compared with non-never smokers at baseline, when all the other effects were held at constant. The odds of never smokers at baseline being regular smokers at follow-up was decreased by about 94.4% compared with non-never smokers at baseline. Thus, the odds of being a regular smoker at follow-up were about 16.7 times lower for baseline never smokers than baseline ever smokers.

The log odds of baseline ex-smokers/occasional smokers being monthly regular smokers at follow-up were decreased by 0.868 units (β= -0.868), when the other predictors were held constant. The odds of baseline ex-smokers/occasional smokers being monthly regular smokers at follow-up were decreased by 58% compared with non ex-smokers/occasional smokers at baseline. The likelihood of baseline ex-smokers/occasional smokers becoming monthly regular smokers at follow-up was 2.5 times lower than non ex-smokers/occasional smokers at baseline.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B, allocation of school and location of schools).

The final fixed-effect output for the outcome of regular smoker at follow-up is shown in Table 6.17. The results indicate that the estimators for level-1 predictors remained about the same. Between schools, the school allocation to intervention and control schools was

significantly related to the probability of being a monthly regular smokers at follow-up (γ_{01}=-0.359, p<0.001).The probability of being a monthly regular smokers at follow-up in intervention schools was lower by about 30.2%. Students in the intervention schools were 1.4 times less likely to be a monthly regular smoker at follow-up than students in the control schools. The location of school was not related to the outcome of monthly regular smoker at follow-up.

Table 6.17
Final fixed effects with random intercept: Adding level-1 and level-2 variables for outcome regular smokers (monthly) at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-0.387	0.383	-1.011	.312	0.679
Intervention=1	-0.359	0.159	-2.254	0.024*	0.698
KKinabalu=1	0.154	0.170	0.905	0.366	1.166
Boy=1	0.063	0.171	0.369	0.712	1.065
Hostel=1	-0.270	0.334	-0.807	0.420	0.764
SS_parents=1	-0.002	0.163	-0.014	0.989	0.998
SS_sibling=1	0.117	0.183	0.640	0.522	1.125
NS_B=1	-2.916	0.327	-8.921	0.000*	0.054
ES_B=1	-0.922	0.353	-2.615	0.009*	0.398

Note: Probability distribution:Binomial; Link function:logit

6.9.1.2 Data set with first assumption (baseline participants who were missing at follow-up retained their baseline smoking status at follow-up)

In data set with first assumption, there were 1948 students.

a) Outcome : Never smoked at follow-up

Null model

The estimated log odds were 1.430 (SE=0.132, t=10.808, p<0.001). The odds ratio was 4.179(2.718281.430). This odds ratio suggested that within the average school, students were about 4 times more likely to be never smokers than ever smokers in the follow-up.

The probability of being classified as a never smoker at follow-up was estimated as [1/(1+$e^{-(1.430)}$)] or 0.8069 (80.7%). The estimated probability was slightly larger than the probability in

the single level analysis without predictors (79.8%).

The variance components showed that the z-test (z=0.132) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0386. Thus, approximately only 3.8% of variability in never smokers at follow-up arose because of variability between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the five predictors (boy, stay in hostel, smoking status of parents, smoking status for siblings and never smokers at baseline). The fixed-effect output showed that being a boy and being a baseline never smoker were significantly related to the outcome of never smokers at follow-up.

Being a boy was negatively related to the probability of being a never smoker at follow-up. Being a boy reduced the log odds of students who were never smokers at follow-up by 0.529 units (β=-0.529), when the other effects were held constant. Exponentiating the log odds resulted in an odds ratio of 0.589. The odds for a boy of being a never smoker at follow-up were about 41.1% lower than girls. The odds of being a never smoker at follow-up were about 0.6 times lower for boys than girls or alternatively boys were about 1.7 times more likely to be ever smokers than girls at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the seven predictors (boy, hostel, SS_parents, SS_sibling, NS_B, allocation of school and location of schools).

The final fixed- effect output for being a never smoker at follow-up outcome is presented in

Table 6.18. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significantly related to the smoking status of never smokers at follow-up.

Table 6.18
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for outcome of never smoker at follow-up (matched data with 1st assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-2.978	0.210	-14.185	0.000*	0.051
Intervention=1	0.273	0.168	1.626	0.104	1.314
KKinabalu=1	0.011	0.170	0.063	0.950	1.011
Boy=1	-0.513	0.179	-2.869	0.004*	0.599
Hostel=1	-0.156	0.362	-0.432	0.666	0.855
SS_parents=1	-0.272	0.169	-1.608	0.108	0.762
SS_sibling=1	-0.210	0.208	-1.009	0.313	0.811
NS_B=1	6.186	0.123	50.391	0.000*	485.859

Note: Probability distribution:Binomial; Link function:logit

b) Outcome : Ex-smokers/occasional smoker at follow-up

Null model

The estimated log odds were -1.800 (SE=0.138, t=13.090, p<0.001). The odds ratio was $0.165(2.71828^{-(1.800)})$. This odds ratio suggested that within the average school, students were less likely to be ex-smokers/occasional smokers at follow-up.

The probability of students having a smoking status of ex-smoker/occasional smoker at follow-up was estimated as $[1/(1+e^{-(1.800)})]$ or 0.1652 (16.5%). The estimated probability was slightly larger than the probability in the single level analysis without predictors (14.9%).

The variance components showed that the z-test (z=0.137) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0340. Thus, approximately only 3.4% of variability in relation to never smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B). If the missing participants at follow-up were assumed to retain their baseline smoking status, the multilevel regression analysis showed similar results to those when the matched data set was used. Thus, being an ex-smoker/occasional smoker at follow-up was significantly related to gender (boy) and smoking status of never smoking at baseline and baseline ex-smoker/occasional smoker. Compared with girls, boys were positively and significantly related to the probability of being an ex-smoker/occasional smoker at follow-up. Being a boy increased the log odds of students who were ex-smokers/occasional smokers at follow-up by 0.423 units (β= 0.423), when the other effects were held constant. Exponentiating the log odds resulted in an odds ratio of 1.527. The odds of a boy of being an ex-smokers/occasional smoker at follow-up were increased by about 82.2% when compared to being a girl. Thus, the odds of being an ex-smoker/occasional smoker at follow-up were about 1.5 times higher for boys than for girls.

The log odds of being an ex-smoker/occasional smoker at follow-up for never smokers at baseline were decreased by 2.165 units (β=-2.165) compared with non-never smokers at baseline, when the other effects were held constant. The odds of baseline never smokers being ex- smokers/occasional smokers at follow-up was lower by about 88.5% when compared with non-never smokers at baseline. The odds of being an ex-smoker/occasional smoker at follow-up were 8.7 times lower for baseline never smokers than for baseline ever smokers.

While being a never smoker at baseline was negatively related to the smoking status of ex-smokers/occasional smokers at follow-up, being an ex-smoker/occasional smoker at baseline was positively related to being an ex-smoker/occasional smoker at follow-up. The log odds of ex-smokers/occasional smokers at baseline retaining their smoking status at follow-up were increased by 2.361 units (β= 2.236), when the other predictors were held

constant. Baseline ex-smokers/occasional smokers were 10.5 times more likely to be an ex-smoker/occasional smoker at follow-up than students who were not ex-smokers/occasional smokers at baseline.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors (boy, hostel, SS_parents, SS_sibling, NS_B, ES_B, allocation of school and location of schools).

The final fixed-effect output for the outcome ex-smoker/occasional smoker at follow-up is presented in Table 6.19. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significantly related to the smoking status of ex-smoker/occasional smoker at follow-up.

Table 6.19
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome ex-smoker/occasional smoker at follow-up (matched data with 1st assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-1.185	0.364	-3.260	0.001*	0.306
Intervention=1	0.054	0.161	0.339	0.735	1.056
KKinabalu=1	-0.143	0.165	-0.866	0.386	0.867
Boy=1	0.434	0.183	2.367	0.018*	1.544
Hostel=1	0.345	0.299	1.156	0.248	1.142
SS_parents=1	0.286	0.161	1.778	0.076	1.331
SS_sibling=1	0.004	0.200	0.019	0.985	1.004
NS_B=1	-2.174	0.293	-7.410	0.000*	0.114
ES_B=1	2.361	0.298	7.920	0.000*	10.601

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: regular smokers (monthly) at follow-up

Null model

The estimated log odds were -2.915 (SE=0.139, t=-20.984, p<0.001). The odds ratio was $0.054(2.71828^{2.915})$. This odds ratio suggested that within the average school, students were less likely to be monthly regular smokers at follow-up.

The probability of students having the smoking status of regular smoker (monthly) at follow-up was estimated as [1/ (1+$e^{-(2.915)}$)] or 0.0542 (5.4%). The estimated probability was similar to the probability in the single level analysis without predictors (5.3%).

The variance components showed that the z-test (z=0.091) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0269. Hence only 2.7% of variability in monthly regular smoker at follow-up arose because of variability between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B). The fixed-effect output showed that being a monthly regular smoker at follow-up was negatively and significantly related to being a baseline never smoker and being a baseline ex-smoker/occasional smoker. The log odds of being a monthly regular smoker at follow-up for never smokers at baseline decreased by 3.972 units (β=-3.972) when compared with non-never smokers at baseline when the other effects were held constant. The odds of never smokers at baseline being regular smokers at follow-up was decreased by about 98.1% compared with non-never smokers at baseline. The odds of being a regular smoker (monthly) at follow-up were about 52 times higher for baseline ever smokers than baseline never smokers.

The log odds of baseline ex-smokers/occasional smokers being monthly regular smokers at follow-up decreased by 2.330 units (β= -2.330) when the other predictors were held constant. The odds of baseline ex-smokers/occasional smokers being monthly regular smokers at follow-up decreased by 90.3% when they were compared with non ex-smokers/occasional smokers at baseline. The likelihood of baseline ex-smokers/occasional smokers becoming monthly regular smokers at follow-up was 10.7 times lower than for

baseline non ex-smokers/occasional smokers.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors(, boy, hostel, SS_parents, SS_sibling, NS_B and ES_B, allocation of school and location of schools).

The final fixed-effect output for the monthly regular smoker at follow-up outcome is presented in Table 6.20. The results show that the estimators for level-1 predictors remained about the same. Between schools, the school allocation to intervention and control schools was significantly related to the probability of being a monthly regular smoker at follow-up (γ_{01}=-0.319, p<0.001).The probability of being a regular monthly smoker at follow-up was lower by about 27.3% for students who attended an intervention rather than control school. Students attending control schools were 1.4 times more likely to be regular smokers at follow-up than students attending intervention schools. The location of school was not related to the outcome of regular smoker (monthly).

Table 6.20
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome of regular smoker (monthly) at follow-up (matched data with first assumption)

Model term	β	SE	t	Sig.	OR
Intercept	0.681	0.331	2.056	0.040*	1.976
Intervention=1	-0.319	0.150	-2.126	0.034*	0.727
KKinabalu=1	0.146	0.159	0.923	0.356	1.158
Boy=1	0.063	0.167	0.380	0.704	1.065
Hostel=1	-0.244	0.336	-0.726	0.468	0.784
SS_parents=1	-0.053	0.153	-0.346	0.729	0.948
SS_sibling=1	0.178	0.169	1.054	0.292	1.195
NS_B=1	-4.007	0.266	-15.040	0.000*	0.018
ES_B=1	-2.380	0.291	-8.175	0.000*	0.093

Note: Probability distribution:Binomial; Link function:logit

6.9.1.3 Data set with second assumption (baseline participants who were missing at follow-up were assumed to be regular smokers)

The data set with second assumption included 1948 students.

a) Outcome : Never smokers at follow-up

Null model

The estimated log odds were 0.922 (SE=0.085, t=10.852, p<0.001). The odds ratio was 2.514($2.71828^{0.922}$). This odds ratio suggested that within the average school, students were 2.5 times more likely to be never smokers than ever smokers at the follow-up. The average school-level probability, of students being never smokers at follow-up was estimated as [$1/(1+e^{-(0.922)})$] or 0.7154 (71.5%). The estimated probability was slightly larger than the probability in the single level analysis without predictors (71.1%).

The variance components showed that the z-test (z=0.045) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0135. Thus, approximately only 1.3% of variability among never smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the five predictors (boy, hostel, SS_parents, SS_sibling and NS-B). Being a boy was again significantly and negatively related to the probability of being a never smoker at follow-up. The odds for a boy remaining a never smoker at follow-up were decreased by about 55.1%. Thus, boys were about 2 times more likely than girls to be ever smokers at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the seven predictors (boy, hostel, SS_parents, SS_sibling, NS_B,

allocation of school and location of schools).

The final fixed-effect output for the outcome never smokers at follow-up is presented in Table 6.21. The results showed the estimators for level-1 predictors remained about the same. The probability of being a never smoker at follow-up was significantly related to allocation of school to intervention and control schools (γ_{01}=0.306, p<0.001). Students attending an intervention school were 1.3 times more likely than students attending control schools to be never smokers at follow-up. The location of school was not related to the outcome of never smoker at follow-up.

Table 6.21
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome never smoker at follow-up (matched data with 2nd assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-3.225	0.201	-16.014	0.000	0.040
Intervention=1	0.306	0.136	2.243	0.025*	1.358
KKinabalu=1	0.142	0.140	1.020	0.302	1.153
Boy=1	-0.510	0.142	-3.581	0.000*	0.601
Hostel=1	0.021	0.290	0.074	0.941	1.022
SS_parents=1	-0.258	0.136	-1.898	0.058	0.772
SS_sibling=1	0.166	0.171	0.969	0.333	1.180
NS_B=1	5.131	0.096	53.620	0.000*	169.247

Note: Probability distribution:Binomial; Link function:logit

b) Outcome : Ex-smokers/occasional smokers at follow-up

Null model

The estimated log odds were -2.103 (SE=0.131, t=-16.005, p<0.001). The odds ratio was 0.122($2.71828^{-(2.103)}$). This odds ratio suggests that within the average school, students were less likely to be ex-smokers/occasional smokers at follow-up. The probability of students being ex-smokers/occasional smokers at follow-up was estimated as [$1/(1+e^{-(2.103)})$] or 0.1652 (12.2%). The estimated probability was slightly larger than the probability in the single level analysis without predictors (11.4%).

The variance components showed that the z-test (z=0.113) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0332. Thus, approximately 3.3% of the variability among ex-smoker/occasional smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B). The results when the data set based on the second assumption was used were similar to the results when the matched data set and the data set based on the first assumption were used. Thus, being a boy increased the log odds of students who were ex-smokers/occasional smokers at follow-up by 0.391 units (β= 0.391), when the other effects were held at constant. The odds of being an ex-smoker/occasional smoker at follow-up were about 1.5 times higher for boys than for girls.

The log odds of being an ex-smoker/occasional smoker at follow-up for baseline never smokers were lower by 2.189 units (β=-2.189) when compared with baseline non-never smokers at baseline, when the other effects were held at constant. The odds of being an ex-smoker/occasional smoker at follow-up were 15.8 times lower for baseline never smokers than for baseline ever smokers.

Being a baseline ex-smoker/occasional smoker was positively related to the outcome of ex-smokers/occasional smokers at follow-up. The log odds of ex-smokers/occasional smokers at baseline retaining their smoking status at follow-up were increased by 0.979 units (β= 0.979), when the other predictors were held at constant. Baseline ex-smokers/occasional smokers were 2.7 times more likely to be ex-smokers/occasional smokers at follow-up than non ex-smokers/occasional smokers at baseline.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors (boy, hostel, SS_parents, SS_sibling, NS_B, ES_B, allocation of school and location of schools).

The final fixed-effect output for outcome ex-smokers/occasional smokers at follow-up is presented in Table 6.22. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significantly associated with being an ex-smoker/occasional smoker at follow-up.

Table 6.22
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome of ex-smoker/occasional smoker at follow-up (matched data with 2nd assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-1.090	0.352	-3.102	0.002*	0.336
Intervention=1	0.017	0.151	0.110	0.913	1.017
KKinabalu=1	-0.148	0.153	-0.967	0.334	0.862
Boy=1	0.400	0.179	2.238	0.025*	1.492
Hostel=1	0.398	0.278	1.430	0.153	1.488
SS_parents=1	0.225	0.150	1.502	0.133	1.252
SS_sibling=1	-0.003	0.180	-0.019	0.985	0.997
NS_B=1	-2.203	0.290	-7.582	0.000*	0.111
ES_B=1	0.971	0.276	3.514	0.000*	2.642

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly) at follow-up

Null model

The estimated log odds were -1.559 (SE=0.081, t=-19.319, p<0.001). The odds ratio was 0.210 ($2.71828^{1.559}$). Thus, within the average school, students were approximately 5 times less likely to be regular smokers (monthly) at follow-up. The probability of students' smoking status of never smokers at follow-up was estimated as [1/ ($1+e^{-(1.559)}$)] or 0.2103 (21.0%). The estimated probability was slightly higher than the probability in the single level analysis without predictors (17.5%).

The variance components showed that the z-test (z=0.030) was not significant and indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.009. Thus, approximately only 0.9% of the variability among regular smokers (monthly) at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B). The fixed-effect output showed that being a regular smoker (monthly) at follow-up was negatively and significantly related to being a baseline never smoker (NS_B) and being a baseline ex-smoker/occasional smoker (ES_B). Baseline ever smokers were about 14 times more likely to be regular monthly smokers than baseline never smokers. Baseline ex-smokers/occasional smokers were 2.8 times less likely than participants who were not baseline ex-smokers/occasional smokers of being regular smokers (monthly) at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the eight predictors (boy, hostel, SS_parents, SS_sibling, NS_B and ES_B, allocation of school and location of schools).

The final fixed-effect output for being a regular smoker at follow-up is presented in Table 6.23. Attending an intervention school was significantly related to the probability of being a regular smoker (monthly) at follow-up (γ_{01}=-0.284, p<0.001). Students attending control schools were 1.3 times more likely to be regular smokers (monthly) at follow-up than students attending intervention schools. The location of school was not related to the outcome of regular smoker (monthly) at follow-up.

Table 6.23
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome regular smoker (monthly) at follow-up (matched data with second assumption)

Model term	β	SE	t	Sig.	OR
Intercept	0.643	0.326	1.972	0.049*	1.902
Intervention=1	-0.284	0.130	-2.192	0.029*	0.753
KKinabalu=1	-0.023	0.133	-0.176	0.861	0.977
Boy=1	0.261	0.148	1.766	0.078	1.298
Hostel=1	-0.341	0.316	-1.078	0.281	0.711
SS_parents=1	0.063	0.129	0.492	0.623	1.065
SS_sibling=1	-0.121	0.147	-0.829	0.407	0.886
NS_B=1	-2.645	0.269	-9.838	0.000*	0.071
ES_B=1	-1.023	0.276	-3.703	0.000*	0.359

Note: Probability distribution:Binomial; Link function:logit

6.9.1.4 Summary of the impact of the intervention on smoking status using multilevel analysis with random intercept for matched participants

Table 6.24 shows the summary of findings from the multilevel analyses using all three data sets (matched data set, data set with first assumption and data set with second assumptions. The total number of participants in the matched data set was 1679 students whereas the other two data sets had n=1948 students. Only binary data was drawn upon when these data sets were used in the multilevel analyses with random intercepts.

The ICC which provides an indication of the variability of the different categories of smoking status at follow-up that arises as a consequence of variability between schools was very low for all smoking behaviour outcomes at follow-up regardless of which data set was used. The range of ICCs for never smokers at follow-up was between 3.8% and 4.4%. The range for ex-smokers/occasional smokers was between 3.2% and 3.4%. The range for regular smoking at follow-up was between 2.7% and 6.4%.

The addition of level-1 predictors into the analysis showed a similar pattern for all data sources. For level-1 (individual level) predictors, boys were significantly less likely to be

never smokers but significantly more likely to be ex-smokers/occasional smokers and regular smokers at follow-up. The status of ex-smokers/occasional smokers at baseline was only significantly related to ex-smokers/occasional smokers and regular smokers (monthly) at follow-up. Baseline ex-smokers/occasional smokers were more likely to be ex-smokers/occasional smokers but less likely to be regular smokers at follow-up.

Table 6.24 also shows the impact of being allocated to the intervention arm of the study on smoking status at follow-up. When each of the three data sets were used, it appeared that students attending the intervention schools were significantly less likely than students attending the control schools to be regular smokers (monthly) at follow-up. Additionally, when the data set with the second assumption was used students attending schools that were allocated to the intervention arm of the study were significantly more likely to be never smokers. The second assumption was the most conservative assumption because all baseline participants who were missing at follow-up were assumed to be regular smokers. In summary, the smoking status of students at follow-up was predicted by gender (being boy), smoking status at baseline and allocation of the school to the intervention arm of the study. Follow-up smoking status was not significantly related to staying in school hostel, smoking status of parents and siblings and location of school.

Table 6.24

Summary of results on the impact of intervention on smoking status using multilevel analysis with random intercept for matched participants

Data	Outcome	Significant factors		
		Null	Level-1	Level-2
A) Matched data n=1679	i) Never smokers (NS_P)	Intercept (+ve*) ICC:4.4%	Intercept (-ve*) Boy (-ve*) NS_B (+ve*)	-
	ii) Ex-smokers/ occasional smokers (ES_P)	Intercept (-ve*) ICC: 3.2%	Boy (+ve*) NS_B (-ve*) ES_B (+ve*)	-
	iii) Regular smokers(monthly) (RSM_P)	Intercept (-ve*) ICC:6.4%	NS_B (-ve*) ES_B (-ve*)	Intervention (-ve*)
B) Matched data with 1st Assumption n=1948	i) Never smokers (NS_P)	Intercept (+ve*) ICC:3.8%	Intercept (-ve*) Boy (-ve*) NS_B (+ve*)	-
	ii) Ex-smokers/ occasional smokers (ES_P)	Intercept (-ve*) ICC: 3.4%	Intercept (-ve*) Boy (+ve*) NS_B (-ve*) ES_B (+ve*)	-
	iii) Regular smokers(monthly) (RSM_P)	Intercept (-ve*) ICC:2.7%	NS_B (-ve*) ES_B (-ve*)	Intervention (-ve*)
C) Matched data with 2nd Assumption n=1948	i) Never smokers (NS_P)	Intercept (+ve*) ICC:3.8%	Intercept (-ve*) Boy (-ve*) NS_B(+ve*)	Intervention (+ve*)
	ii) Ex-smokers/ occasional smokers (ES_P)	Intercept (-ve*) ICC: 3.4%	Intercept (-ve*) Boy (+ve*) NS_B(-ve*) ES_B(+ve*)	-
	iii) Regular smokers(monthly) (RSM_P)	Intercept (-ve*) ICC:2.7%	NS_B(-ve*) ES_B (-ve*)	Intervention (-ve*)

Note: ( ) : Coefficient
* : Significant

6.9.2 Assessing the effects of the intervention on participants selected according to baseline smoking status using multilevel analysis with random intercepts.

The second multilevel analysis was conducted with random intercepts on matched data and data with first and second assumptions to assess the effect of intervention on participants who were selected according to baseline smoking status. I followed the statistical analysis plan outlined in previous multilevel analysis. These analyses were conducted on matched data, matched data based on the first assumption and matched data based on the second

assumption.

6.9.2.1 Matched data

In the matched data set, there were 1448 baseline never smokers, 188 baseline ex-smokers/occasional smokers and 43 baseline regular smokers (monthly).

a) Outcome : Never smokers at follow-up (selecting only never smokers at baseline)

Null model

The variance components showed that, the z-test (z=0.478) was not significant and indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.01268. Thus, approximately only 1.3% of variability among never smokers at follow-up arose because of variability between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and four predictors (boy, hostel, SS_parents and SS_sibling). The findings showed that boys were 1.89 times more likely than girls to be ever smokers at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2 (school level), the fixed effects estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools). The final fixed-effect output for being a never smoker at follow-up for selected baseline never smokers only is presented in Table 6.25. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significantly related to the smoking status of never smokers at follow up.

Table 6.25
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome never smoker at follow-up for selected baseline never smokers only (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	3.190	0.201	15.903	0.000*	24.291
Intervention=1	0.349	0.197	1.773	0.076	1.418
KKinabalu=1	0.027	0.200	0.135	0.893	1.027
Boy=1	-0.615	0.199	-3.088	0.002*	0.541
Hostel=1	-0.147	0.405	-0.364	0.716	0.863
SS_parents=1	-0.339	0.198	-1.717	0.086	0.712
SS_sibling=1	-0.251	0.242	-1.037	0.300	0.778

Note: Probability distribution:Binomial; Link function:logit

b) Outcome : Ex-smokers/occasional smokers at follow-up (selecting only ex-smokers/occasional smokers at baseline)

Null model

The variance components showed that the z-test (z=0.175) was not significant which indicated that the intercept variance did not vary between schools. The ICC was 0.0505 indicating that approximately 5.1% of the variability among ex-smokers/occasional smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and four predictors (boy, hostel, SS_parents and SS_sibling). The fixed-effect output showed that there was no significant relation between the level-1 predictors and the outcome of ex-smoker/occasional smokers at follow-up among baseline ex-smokers/occasional smokers.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2, the fixed effects estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools). The final fixed- effect output for the outcome of being an ex-

smoker/occasional smoker at follow-up for selected baseline ex-smokers/occasional smokers only is presented in Table 6.26. The results indicate the estimators for level-1 predictors remained about the same. Baseline ex-smoker/occasional smoker students in the intervention schools were nearly 3 times more likely than baseline ex-smoker/occasional smoker students in the control schools to remain ex-smokers/occasional smokers at follow-up.

Table 6.26
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for outcome ex-smokers/occasional smokers at follow-up for selected baseline ex-smokers/occasional smokers (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	0.653	0.680	0.961	0.338	1.922
Intervention=1	1.024	0.392	2.612	0.010*	2.785
KKinabalu=1	-0.471	0.397	-1.186	0.237	0.624
Boy=1	0.419	0.566	0.741	0.460	1.520
Hostel=1	1.195	1.038	1.151	0.251	3.305
SS_parents=1	0.128	0.362	0.355	0.723	1.137
SS_sibling=1	0.109	0.393	0.278	0.782	1.115

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly) at follow-up (for baseline regular smokers (monthly) only)

Null model

The variance components showed that the z-test (z=0.221) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0436. Thus, approximately only 4.4% of variability among regular smokers (monthly) at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the four predictors (boy, hostel, SS_parents and SS_sibling). The fixed-effect output showed that the outcome of regular smoker (monthly) at follow-up among baseline regular smokers (monthly) was significantly related to

the intercept, being a boy and staying in the hostel. The odds ratio for a boy produced a huge value because all the regular smokers (monthly) at follow-up were boys. In addition, none of the regular smokers (monthly) at follow-up stayed in the school hostel during the school term.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from the level-2, the fixed effect estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools).

The final fixed-effect output for the outcome regular smokers (monthly) at follow-up for baseline regular smokers (monthly) is presented in Table 6.27. The results indicate the estimators for level-1 predictors remained about the same. Being a regular smoker (monthly) at follow up among baseline regular smokers (monthly) was not significantly related to either of the school-level variables.

Table 6.27
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome regular smoker (monthly) at follow-up for baseline regular smokers (monthly) only (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-17.510	1.145	-15.289	0.00*	0.000
Intervention=1	-0.179	0.714	-0.251	0.803	0.836
KKinabalu=1	0.420	0.710	0.591	0.558	1.521
Boy=1	17.020	0.547	31.096	0.000*	24654984.042
Hostel=1	-17.942	0.887	-20.216	0.000*	0.000
SS_parents=1	-0.462	0.705	-0.655	0.517	0.630
SS_sibling=1	1.044	0.776	1.345	0.187	2.841

Note: Probability distribution:Binomial; Link function:logit

6.9.2.2 Matched data with first assumption

In the matched data set based on the first assumption, there were 1615 baseline never smokers, 256 baseline ex-smokers/occasional smokers and 77 baseline regular smoker

(monthly).

a) Outcome: Never smokers at follow-up (for baseline never smokers only)

Null model

The variance components showed that the z-test (z=0.512) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.01347. Thus, approximately 1.3% of the variability among never smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the four predictors (boy, hostel, SS_parents and SS_sibling). The fixed-effect output indicates that the outcome of never smokers at follow-up was significantly related to the intercept and gender (boy). Boys were about 1.7 times more likely than girls to be ever smokers at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level -2 , the fixed effects estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools). The final fixed-effect output for the outcome of never smoker at follow-up for selected baseline never smokers is presented in Table 6.28. The results showed the estimators for level-1 predictors remained about the same. Both school level variables were not significantly related to being a never smoker at follow-up.

Table 6.28
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome never smoker at follow-up for baseline never smokers only (matched data with 1st assumption)

Model term	β	SE	t	Sig.	OR
Intercept	3.232	0.186	17.343	0.000*	25.332
Intervention=1	0.318	0.187	1.702	0.089	1.374
KKinabalu=1	0.008	0.189	0.044	0.965	1.008
Boy=1	-0.548	0.189	-2.895	0.004*	0.578
Hostel=1	-0.167	0.387	-0.431	0.666	0.846
SS_parents=1	-0.307	0.189	-1.626	0.104	0.736
SS_sibling=1	-0.253	0.234	-1.080	0.280	0.777

Note: Probability distribution:Binomial; Link function:logit

b) Outcome: Ex-smoker/occasional smokes at follow-up (for baseline ex-smokers/occasional smokers only)

Null model

The variance components showed that the z-test (z=0.194) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0557. Thus, approximately 5.6% of the variability among never smokers at follow-up was due to variability between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the four predictors (boy, hostel, SS_parents and SS_sibling) The fixed-effect output showed that among baseline ex-smokers/occasional smokers being an ex-smoker/occasional smoker at follow-up was not significantly related to level-1 variables.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2, the fixed effects were for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools).

The final fixed-effect output for being an ex-smoker/occasional smoker at follow-up among

baseline ex-smokers/occasional smokers is presented in Table 6.29. The results indicated that the estimators for level-1 predictors remained about the same. Between schools, the school allocation to intervention and control schools was significantly related to the probability of ex-smokers/occasional smokers retaining their smoking status at follow-up (γ_{01}=0.941, p<0.05). Baseline ex-smokers/occasional smoker students who attended intervention schools were 2.6 times more likely than baseline ex-smokers/occasional smokers who attended control schools to be ex-smokers/occasional smokers at follow-up.

Table 6.29
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome ex-smoker/occasional smoker at follow-up for baseline ex-smokers/occasional smokers only (matched data with 1st assumption)

Model term	β	SE	t	Sig.	OR
Intercept	1.066	0.636	1.676	0.095	2.905
Intervention=1	0.941	0.365	2.574	0.011*	2.562
KKinabalu=1	-0.398	0.384	-1.036	0.301	0.672
Boy=1	0.355	0.543	0.654	0.514	1.426
Hostel=1	0.891	0.942	0.945	0.345	2.437
SS_parents=1	0.170	0.343	0.497	0.619	1.186
SS_sibling=1	0.070	0.368	0.190	0.849	1.073

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smoker (monthly) at follow-up (for baseline regular smokers (monthly) only)

Null model

In relation to the variance components, the z-test did not produce results to show the variation of the intercept variance between schools. So the ICC could not be calculated.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and four predictors (boy, hostel, SS_parents, and SS_sibling). The log odds for regular smokers (monthly) at follow-up were decreased by 12.628 units (β=-12.628) if students stayed in a school hostel during school term, when the other effects were held at constant. However, there was no comparison between staying

and not staying in school hostel for regular smokers (monthly) because none of the baseline regular smokers (monthly) stayed in a school hostel during school term at follow-up.

Having siblings who smoked increased the log odds of students who were regular smokers (monthly) at follow-up by 1.219 units (β=1.219), when the other effects were held constant. For baseline regular smokers (monthly) the odds of being a regular smoker (monthly) at follow-up were about 3 times higher when the student had siblings who were smokers.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2, the fixed effects estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools). The final fixed-effect output for regular smokers (monthly) at follow-up when baseline regular smokers (monthly) only were selected is presented in Table 6.30. The results indicate that the estimators for level-1 predictors remained about the same. Both school level variables were not significantly associated with the smoking status of baseline regular smokers (monthly) at follow up.

Table 6.30
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for regular smokers (monthly) at follow-up among baseline regular smokers (monthly only)(matched data with 1st assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-0.915	1.221	-0.750	0.456	0.400
Intervention=1	0.022	0.589	0.037	0.971	1.022
KKinabalu=1	0.497	0.582	0.855	0.396	1.644
Boy=1	1.414	0.918	1.540	0.128	4.111
Hostel=1	-13.382	0.810	-16.517	0.000	0.000
SS_parents=1	-0.771	0.549	-1.406	0.164	0.462
SS_sibling=1	1.296	0.615	2.107	0.039	3.654

Note: Probability distribution:Binomial; Link function:logit

6.9.2.3 Matched data with 2nd assumption

The total number of baseline never smokers (1615), ex-smokers/occasional smokers (256) and regular smokers(monthly)(77) in the matched data set with 2nd assumption were similar to the matched data with 1st assumption.

a) Outcome: Never smokers at follow-up (selecting only never smokers at baseline)

Null model

The variance components showed that the z-test (z=0.512) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.01347. Thus, approximately only 1.3% of variability among never smokers at follow-up was explained by variability between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and four predictors (boy, hostel, SS_parents and SS_sibling). The fixed-effect output showed that the outcome of never smoker at follow-up was significantly related to the intercept and gender (boy) among baseline never smokers only. Boys were about 1.7 times more likely than girls to be ever smokers at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-2, the fixed effects estimated for the intercept and the six predictors (boy, hostel,SS_parents, SS_sibling, allocation of school and location of schools). The final fixed-effect output for being a never smoker at follow-up for baseline never smokers only is presented in Table 6.31. The allocation to intervention and control schools was significantly related to the probability of being a never smoker at follow-up (γ_{01}=0.324, p<0.001). The probability of being a never smoker at follow-up in the intervention schools was about 72.3% higher than the probability of being a never smoker at follow-up in the control schools. However, this result is likely to have arisen because more participants were missing at follow-up in the control schools. Students in the intervention

schools were 1.4 times more likely to be never smokers at follow-up.

Table 6.31
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for outcome never smokers at follow-up for selected baseline never smokers (matched data with 2nd assumption)

Model term	β	SE	t	Sig.	OR
Intercept	1.908	0.171	11.145	0.000	6.738
Intervention=1	0.324	0.143	2.261	0.024*	1.382
KKinabalu=1	0.150	0.146	1.024	0.306	1.162
Boy=1	-0.522	0.146	-3.571	0.000*	0.593
Hostel=1	0.019	0.300	0.065	0.948	1.020
SS_parents=1	-0.276	0.143	-1.930	0.054	0.759
SS_sibling=1	0.185	0.186	0.991	0.322	1.203

Note: Probability distribution:Binomial; Link function:logit

b) Outcome: Ex-smoker/occasional smoker at follow-up (for baseline ex-smokers/occasional smokers only)

Null model

In relation to the variance components showed that the z-test (z=0.027) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0081. Thus, approximately 0.8% of the variability among ex-smokers/occasional smokers at follow-up was explained by variation between schools.

Model with addition of level-1 predictors

The fixed effects consisted of the intercept and the four predictors (boy, hostel, SS_parents and SS_sibling). The fixed-effect output showed that among baseline smokers/occasional smokers only, there was no significant relation between the variables at level-1 and the outcome of ex-smoker/ occasional smoker at follow-up.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-1 and level-2, the fixed effect estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools).

The final fixed-effect output for being an ex-smoker/occasional smoker at follow-up among baseline ex-smokers/occasional smokers only is presented in Table 6.32. The results indicated that the estimations for level-1 predictors remained about the same. The school allocation to intervention and control schools and the location of school showed were not significantly related to the probability of being an ex-smoker/occasional smoker at follow-up.

Table 6.32
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for the outcome of ex-smoker/occasional smoker at follow-up among baseline ex-smokers/occasional smokers only (matched data with 2nd assumption)

Model term	β	SE	t	Sig.	OR
Intercept	0.084	0.477	0.176	0.861	1.087
Intervention=1	0.414	0.259	1.594	0.112	1.512
KKinabalu=1	-0.283	0.267	-1.061	0.290	0.753
Boy=1	0.158	0.409	0.385	0.700	1.171
Hostel=1	0.752	0.608	1.237	0.217	2.122
SS_parents=1	0.024	0.261	0.093	0.926	1.025
SS_sibling=1	0.011	0.274	0.041	0.968	1.011

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly) at follow-up (for baseline regular smokers (monthly) only)

Null model

In relation to variance components, the z-test did not produce results to show the variation of the intercept variance between schools. So I was unable to calculate the ICC.

Model with addition of level-1 predictors

There were 77 common subjects with estimation for four fixed effects and one random effect. The four predictors were boy, hostel, SS_parents and SS_sibling. The fixed-effect output showed that among baseline regular smokers (monthly), being regular smokers (monthly) at

follow-up was significantly related to staying in the school hostel and having siblings who were smokers. The log odds for regular smokers (monthly) at follow up were decreased by 13.382 units (β=-13.382) if students stayed in a school hostel during school term, when the other effects were held at constant. However, there was no comparison between staying and not staying in school hostel for regular smokers (monthly) because none of the baseline regular smokers (monthly) stayed in a school hostel during school term at follow-up. Having a smoker sibling increased the log odds by 1.219 units (β=1.219), when the other effects were held constant. Thus, the odds ratio of being a regular smoker (monthly) at follow-up was 3 times higher when the student had a smoker sibling.

Model with addition of level-1 and level-2 predictors

With the addition of the two predictors from level-1 and level-2, the fixed effect estimated for the intercept and the six predictors (boy, hostel, SS_parents, SS_sibling, allocation of school and location of schools). The final fixed-effect output for being a regular smoker (monthly) at follow-up among baseline regular smokers (monthly) only is presented in Table 6.33. The results indicated that the estimators for level-1 predictors remained about the same. Both school level variables were not significantly related to the smoking status of being a regular smoker (monthly) at follow-up among selected regular smokers (monthly) at baseline.

Table 6.33
Final fixed effects model with random intercept: Adding level-1 and level-2 variables for being a regular smoker (monthly) at follow-up among baseline regular smokers (monthly) only (matched data with 2nd assumption)

Model term	β	SE	t	Sig.	OR
Intercept	-0.915	1.221	-0.750	0.456	0.400
Intervention=1	0.022	0.589	0.037	0.971	1.022
KKinabalu=1	0.497	0.582	0.855	0.396	1.644
Boy=1	1.414	0.918	1.540	0.128	4.111
Hostel=1	-13.382	0.810	-16.517	0.000*	0.000
SS_parents=1	-0.771	0.549	-1.406	0.164	0.462
SS_sibling=1	1.296	0.615	2.107	0.039*	3.654

Note: Probability distribution:Binomial; Link function:logit

6.9.2.4 Summary of the impact of the intervention on the follow-up smoking status of students using multilevel analysis with random intercept for selected baseline participants

Table 6.34 contains a summary of the findings from the multilevel analyses for selected baseline participants using three data sets (the overall matched data set, the data set based on the first assumption and the data set based on the second assumption). When the overall matched data set was used, the total number of baseline selected students was baseline never smokers (n= 1448), baseline ex-smokers/occasional smokers (n=188) and baseline regular smokers (monthly (n=43). When the data sets that were based on the first and second assumptions were used, the number of baseline selected students was baseline never smokers (n=1615), baseline ex-smokers/occasional smokers (n=256) and baseline regular monthly smokers (n=77).

The ICC which provides an indication of the variability of the different categories of smoking status at follow-up that arises as a consequence of variability between schools was very low for all smoking behaviour outcomes at follow-up regardless of which data set was used. The ICC for never smokers in all data set at follow-up was approximately 1.3%. The ICC range for ex-smokers/occasional smokers was between 0.8% and 5.6%. The ICC for regular smoking at follow-up was only obtained from the matched data set and was 4.4%.

Three level-1 (individual level) variables were potentially important influences on the follow-up smoking status of participating students. These variables were being a boy, staying in the school hostel during term time and having at least one sibling who smoked. Being a boy was significantly and negatively associated with being a never smoker at follow-up when each of the three data sets were used and baseline never smokers only were selected. Additionally when the overall matched data set was used (that had no assumptions) and baseline regular smokers only were selected then being a boy was significantly and positively associated with being a regular smoker at follow-up. Staying in the school hostel was significantly and

negatively associated with regular smoking (monthly) at follow-up when baseline regular smokers only were selected irrespective of which of the three data sets was used. When the data set that was based on the first assumption was used and the data set that was based on the second assumption were used but not when the overall matched data set was usedthen having siblings who smoked appeared to be significantly and negatively related to regular smoking at follow-up when baseline regular smokers only were selected.

The impact of the intervention on the follow-up smoking status of students varied according to which students were selected and which data set was used. When baseline never smokers only were selected and the data set that was used was based on the second assumption then the intervention appeared to be significantly and positively associated with being a never smoker at follow-up. When ex-smokers/occasional smokers only were selected and the overall data set and the data set based on the first assumption were used then the intervention appeared to be significantly and positively associated with being an ex-smoker/occasional smoker at follow-up. Hence, students who were ex-smokers/occasional smokers at baseline were more likely to remain ex-smokers/occasional smokers if they attended an intervention school. However, these observations were not repeated when the data set that was used was based on the second assumption.

In sum, when students were selected on the basis of their baseline smoking status their follow-up smoking status was potentially predicted by gender (boy), staying in a school hostel during school term, having siblings who smoked and allocation of schools. The smoking status was not significantly related to the smoking status of parents and location of school.

Table 6.34

Summary of results on the impact of intervention on smoking status using multilevel analysis with random intercept for selected participants at baseline

Data		Outcome	Significant factors		
			Null	**Level-1**	**Level-2**
A)	Matched data	i) Never smoker (NS_P) *-selected never smokers at baseline (n=1448)*	Intercept (+ve)* ICC:1.3%	Boy (-ve)*	-
		ii) Ex-smokers/ occasional smokers (ES_P) *-selected ex-smokers/ occasional smokers at baseline (n=188)*	Intercept (+ve)* ICC: 5.1%	-	Intervention (+ve)*
		iii)Regular smokers(monthly) (RSM_P) *-selected regular smokers (monthly) (n=43)*	ICC:4.4%	Boy (+ve)* School hostel (-ve)*	-
B)	Matched data with 1st Assumption	i) Never smoker (NS_P) *-selected never smokers at baseline (n=1615)*	Intercept (+ve)* ICC:1.3%	Boy (-ve *	-
		ii) Ex-smokers/ occasional smokers (ES_P) *-selected ex-smokers/ occasional smokers at baseline (n=256)*	Intercept (+ve)* ICC: 5.6%	-	Intervention (+ve)*
		iii) Regular smokers(monthly) (RSM_P) *-selected regular smokers (monthly) (n=77)*	Intercept (+ve) *No ICC value*	School hostel (-ve)* Siblings (+ve)*	-
C)	Matched data with 2nd Assumption	i) Never smoker (NS_P) *-selected never smokers at baseline (n=1615)*	Intercept (+ve)* ICC:1.3%	Boy (-ve)*	Intervention (+ve)*
		ii) Ex-smokers/ occasional smokers (ES_P) *-selected ex-smokers/ occasional smokers at baseline (n=256*	Intercept (+ve)* ICC: 0.8%	-	-
		iii) Regular smokers(monthly) (RSM_P) *-selected regular smokers (monthly) (n=77)*	Intercept (+ve) *No ICC value*	School hostel (-ve)* Siblings (+ve)*	-

Note:( ): Coefficient
* = Significant

6.9.3 Assessing the effects of the intervention on matched participants using multilevel analysis with random intercept and random slope.

The analysis plan for the third type of multilevel model with random intercepts and random slopes was conducted using the matched data sets only. The data sets were arranged in a long format where each participant had two observations separated by time at baseline and follow-up. The smoking status outcome was a binary outcome at baseline and follow-up. The purpose of these analyses was to identify the effect of the intervention on participants' smoking status using repeated measures at baseline and follow-up with a seven month time interval. The total number of observations was 3360 from 8 schools.

As in the previous multilevel analyses, I started with the null model to investigate the variation of smoking status outcomes across schools. The findings in relation to the null model and the addition of level-1 predictors were similar to the findings in the previous analyses. The fixed effects consisted of the intercept and the five level-1 predictors (boy, hostel, SS_parents, SS_sibling and time)

Then I added the level-1(individual students) random slope to examine its variation across schools. In this analysis I chose the predictor time to be the slope in order that I could investigate the relationship between the time (at baseline and follow-up) and smoking status across schools. The next step involved adding the school level (level-2) predictors and determining the changes in the fixed effects as in previous analysis. With the addition of level-2 predictors, the fixed effects consisted of the intercept and the seven predictors (boy, hostel, SS_parents, SS_sibling, allocation of schools, location of schools and time). The final analysis focussed on cross level interactions between level-1 and level-2 predictors. In this study I chose the time (at baseline and follow-up) from level-1 (individual level). This analysis focused on the interaction of cross-level effects in the slope model.

6.9.3.1 Matched data

In the matched data set, there were 3360 observation from 1689 students.

a) Outcome: Never smokers

Null model

The estimated log odds in the null model for never smokers at outcome were 1.742 (SE=0.136, t=12.760, p<0.001). The odds ratio was 5.706 and it suggested that within the average school, students were about 6 times more likely to be never smokers than ever smokers in the follow-up. The probability of students' being never smokers at follow-up was estimated as 0.8509 (85.1%). This estimation was larger than the probability in the single level analysis without predictors (84.4%).

The variance components showed that the z-test (z=0.134) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0391. Thus, approximately 3.9% of variability among never smokers was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that the outcome of being a never smoker at follow-up was significantly related to all the included fixed effects. Being a boy, having parents who smoked, having a sibling who smoked and time were all negatively related to the probability of being a never smoker. Staying in the school hostel during the school term was positively related to being a never smoker. Being boys reduced the log odds of remaining a never smoker by 2.297 units (β=-2.297), when the other effects were held constant.

Exponentiating the log odds resulted in an odds ratio of 0.101. Compared with girls, the odds of a boy being a follow-up never smoker were decreased by about 89.9%. The odds of being

a follow-up never smoker were about 0.10 times lower for boys than girls. Alternatively boys were about 10 times more likely than girls to be an ever smoker at follow-up.

Having parents who smoked reduced the log odds of never smokers by 0.522 units (β=-0.522), when the other effects were held constant. The odds ratio was 0.593 and the odds of never smoker students having parents who smoked were about 40.7% lower than for students who did not have parents who smoked. In addition, having a sibling who smoked reduced the log odds of never smokers by 0.855 units (β=-0.855), when the other effects were held constant. The odds ratio of being a follow-up never smoker was about 57.5% lower for students who had siblings who smoked. Students who did not have a sibling who smoked were 2.3 times more likely than students who had a sibling who smoked to be never smokers at follow-up. The log odds of never smokers at follow-up reduced by 0.324 units (β=-0.324), holding the other effects at constant. The probability of a student being a never smoker was about 27.6% lower at follow-up than at baseline. Alternatively students were 1.4 times more likely to be never smokers at baseline than at follow-up.

Staying in a school hostel during term time increased the log odds of being a never smoker at follow-up by 0.274 units (β= 0.274), when the other effects were held constant. Students who stayed in school hostel during school term were about 1.3 times more likely to stay never smokers. Alternatively the likelihood of remaining a never smoker at follow-up was increased by about 56.8% if the student stayed in a hostel.

Model with addition of level-1 predictors and random level-1 slope

The variance for the random slope of never smokers (σ^2_s=0.022) was not significant across schools (z=1.352, p>0.05). These results suggested that across schools there was no variation in the relationship between time (at baseline and follow-up) and being a never smoker.

Model with addition of level-1 and level-2 predictors

The fixed-effect output for being a never smoker at follow-up indicated that the estimations for level-1 predictors remained about the same. Between schools, the school allocation to the intervention and control arms of the study and location of schools were not significantly related to the probability of remaining a never smoker.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 6.35 shows the estimation of fixed effects for the final model with the addition of level-1 and level-2 predictors, random level-1 slope and the cross level interaction for the outcome of never smoke at follow-up. The nominal interaction between time and intervention (time*intervention) and between time and location (time*KKinabalu) showed both of the coefficients were not significant. Intervention and location of school were not significantly related to the probability of remaining a never smoker at follow-up.

Table 6.35
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, a random slope of level-1 predictor (time) and the cross interactions of the level-1 and level-2 variables for never smoking at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	3.864	0.242	15.987	0.000*	47.640
Intervention=1	0.152	0.239	0.636	0.525	1.165
KKinabalu=1	-0.034	0.227	-0.148	0.882	0.967
Boy=1	-2.260	0.175	-12.890	0.000*	0.104
Hostel=1	0.348	0.021	16.305	0.000*	1.417
SS_parents=1	-0.547	0.108	-5.061	0.000*	0.579
SS_sibling=1	-0.860	0.191	-4.507	0.000*	0.423
Time=1	-0.435	0.173	-2.518	0.012*	0.647
(Intervention=1)*(Time=1)	0.206	0.141	1.459	0.145	1.299
(KKinabalu=1)*(Time=1)	0.035	0.143	0.242	0.809	1.035

Note: Probability distribution:Binomial; Link function:logit

b) Outcome: Ex-smokers/occasional smokers

Null model

The variance components showed that the z-test (z=0.145) was not significant and therefore indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0422. Therefore, approximately 4.2% of the variability among ex-smokers/occasional smokers was explained by variation between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that being an ex-smoker/occasional smoker at follow-up was significantly and positively related to being a boy, staying a in school hostel and having parents and siblings who were smokers.

Being a boy increased the log odds of students being an ex-smoker/occasional smoker at follow-up by 2.260 units (β= 2.260), when the other effects were held at constant. Exponentiating the log odds resulted in an odds ratio of 9.579. The odds of being an ex-smoker/occasional smoker at follow-up were about 90.6% higher for boys than for girls. Thus, the odds of being an ex-smoker/occasional smoker at follow-up were about 10 times higher for boys than girls.

The log odds of being a follow-up ex-smoker/occasional were 0.107 units (β=0.107) higher for students who stayed in the school hostel during school term, when the other effects were held at constant. The odds of students who stayed in school hostel being an ex-smoker/occasional smoker at follow-up were about 52.7% higher if they stayed in a hostel. Thus, students who stayed in a school hostel were about 1.1 times more likely to be an ex-smoker/occasional smoker at follow-up.

Having parents who smoked increased the log odds of being an ex-smoker/occasional

smoker at follow-up by 0.466 units (β=0.466), when the other effects were held at constant. Students who had parents who smoked were about 61.4% more likely to be an ex-smoker/occasional smoker at follow-up. Thus, students who had parents who smoked were about 1.6 times more likely than students who did not have parents who smoked to be an ex-smoker/occasional smoker at follow-up. Having a sibling who smoked increased the log odds of ex-smokers/occasional smokers by 0.757 units (β=0.757), when the other effects were held at constant. Thus, students who had a sibling who smoked were about 2 times more likely to be ex-smokers/occasional smokers at follow-up.

Model with addition of level-1 predictors and random level-1 slope

The variance in the random slope for ex-smokers smokers (σ^2_s=0.034) was not significant across schools (z=1.223, p>0.05). These results indicated that across schools there was no variation in the relationship between time (at baseline and follow-up) and ex-smokers/ occasional smokers.

Model with addition of level-1 and level-2 predictors

The fixed-effect output for the outcome of ex-smoker/occasional smoker at follow-up indicated that the estimators for level-1 predictors remained about the same. Both of the school level variables were not significantly related to being an ex-smoker/occasional smoker at follow-up.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 6.36 shows the final model with the addition of level-1 and 2 predictors, random level-1 slope and cross-level interactions for the outcome of being an ex-smoker/occasional smoker at follow-up. The total number of estimated parameters was 12 which were comprised of 10 fixed effects and 2 random effects. This analysis focused on the interaction of cross-level effects in the slope model. The nominal interactions between time and

intervention (time*intervention) and between time and location (time*KKinabalu) were not significant. The intervention and location of school were therefore not significantly related to the probability of being an ex-smoker/occasional smoker at follow-up.

Table 6.36
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, a random slope of level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for being an ex-smoker/occasional smoker at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-3.930	0.295	-13.316	0.000*	0.020
Intervention=1	-0.308	0.295	-1.045	0.296	0.735
KKinabalu=1	-0.082	0.279	-0.293	0.770	0.922
Boy=1	2.231	0.212	10.535	0.000*	9.308
Hostel=1	0.070	0.043	1.617	0.106	1.072
SS_parents=1	0.459	0.087	5.303	0.000*	1.583
SS_sibling=1	0.755	0.138	5.489	0.000*	2.127
Time=1	0.161	0.170	0.946	0.345	1.174
(Intervention=1)*(Time=1)	0.143	0.206	0.696	0.487	1.154
(KKinabalu=1)*(Time=1)	-0.018	0.209	-0.085	0.932	0.982

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly)

Null model

The variance components showed that the z-test (z=0.068) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0202. Thus, approximately 2.0% of variability among regular smokers (monthly) at follow-up was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that the smoking status of regular smokers (monthly) at follow-up was significantly and positively related to being a boy, having siblings who were smokers and time. Regular smoking at follow-up was also significantly but negatively associated with staying in a school hostel.

Boys were about 8 times more likely than girls to be a regular smoker (monthly) at follow-up. Students who had a sibling who smoked were about 2 times more likely to be a regular smoker at follow-up than students who did not have a sibling who smoked. The probability of being a regular smoker (monthly) at follow-up was about 1.7 times higher than the probability of being a regular smoker (monthly) at baseline.

Students who stayed in the school hostel during term time were about 9 times less likely to be regular smokers (monthly) at follow-up than students who did not stay in a school hostel.

Model with addition of level-1 predictors and random level-1 slope

The variance in the regular smokers (monthly) slope (σ^2_s=0.121) was not significant across schools (z=1.292, p>0.05). These results indicate that across schools there was no variation in the relationship between time (at baseline and follow-up) and regular smokers (monthly).

Model with addition of level-1 and level-2 predictors

There were fifteen fixed effect parameters to be estimated (the intercept, boy, hostel, SS_parents, SS_sibling,time, allocation of school and location of school). The fixed- effect output for regular smokers (monthly) at follow-up showed that between schools, the school allocation to the intervention and control arms of the study and location of school were not significantly related to the probability of being a regular smoker (monthly) at follow-up.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 6.37 shows the final model with the addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction for being a regular smoker (monthly) at follow-up. The nominal interaction between (time*intervention) was significantly related to regular smoking (monthly) a follow-up. The interaction coefficient for the time*intervention interaction term represented the difference between the effects of time on intervention schools in relation to

the outcome of regular smoking (monthly) at follow-up versus the effects of time on control schools. The log odds of students who were regular smokers (monthly) at follow-up in intervention schools were -6.632 (-5.927+0.492-1.197=-6.632), with the odds ratio then $e^{-6.632}$ or 0.00132. The log odds of students who were regular smokers (monthly) at follow-up in control schools were -5.435 (-5.927+0.492=-5.435) and the odds ratio ($e^{-5.435}$) was 0.004361. Thus, the odds ratio for the effect of the interaction between time and the intervention on the probability of being a regular smoker at follow-up was 0.302. Alternatively, students were 3.3 times more likely to become regular smokers (monthly) at follow-up if they attended a control school rather than an intervention school. The interaction between the effect of time at follow-up and location of school of in KKinabalu or Keningau (time*KKinabalu) was not significant.

Table 6.37
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, a random slope of level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for the outcome of regular smoking (monthly) at follow-up (matched data)

Model term	β	SE	t	Sig.	OR
Intercept	-5.927	0.303	-19.576	0.000*	0.003
Intervention=1	0.492	0.183	2.694	0.007*	1.636
KKinabalu=1	0.276	0.248	1.113	0.266	1.318
Boy=1	2.105	0.281	7.488	0.000*	8.208
Hostel=1	-2.164	0.943	-2.296	0.022*	0.115
SS_parents=1	0.385	0.219	1.756	0.079	1.470
SS_sibling=1	0.721	0.268	2.695	0.007*	2.056
Time=1	1.093	0.259	4.224	0.000*	2.984
(Intervention=1)*(Time=1)	-1.197	0.269	-4.444	0.000*	0.302
(KKinabalu=1)*(Time=1)	0.027	0.307	0.086	0.931	1.027

Note: Probability distribution:Binomial; Link function:logit

6.9.3.2 Matched data with 1st assumption

In the matched data set, there were 3904 observation from 1952 students.

a) Outcome: Never smoked

Null model

In relation to the variance components, the z-test (z=0.1468) was not significant which indicated that the intercept variance did not vary between schools. The ICC was 0.0352. Thus, approximately 3.5% of the variability among never smokers was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicates that the outcome of never smokers was significantly related to all the included fixed effects. Being a boy, having a parent who smoked, having a sibling who smoked and time were all significantly and negatively related to the probability of being a never smoker at follow-up. Staying in the school hostel during the school term was significantly and positively related to being a never smoker.

Boys were about 11 times more likely than girls to be ever smokers at follow-up. Students who did not have parents who smoked were about 1.6 times more likely than students who did have a parent who smoked to be a never smoker at follow-up. Students who did not have a sibling who smoked were 2.6 times more likely than students who did have a sibling who smoked to be never smokers at follow-up. In relation to time, the probability of being a never smoker decreased by about 21.9% during the time period between baseline and follow-up. Students who stayed in a school hostel during school term were about 1.3 times more likely to stay never smokers than students who did not stay in a school hostel during term time.

Model with addition of level-1 predictors and random level-1 slope

The variance across schools in the random slopes (σ^2_s=0.014) for never smokers was not significant (z=1.365, p>0.05). These results suggested that across schools there was no variation in the relationship between time (at baseline and follow-up) and never smokers.

Model with addition of level-1 and level-2 predictors

The fixed- effect output for the outcome of never smoked at follow-up indicated that the estimators for level-1 predictors remained about the same. Between schools, the school allocation to the intervention and control arms of the study and location of schools were not significantly related to the probability of remaining a never smoker.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 6.38 shows the final model with the addition of level-1 and 2 predictors, random level-1 slope and cross-level interactions for the outcome never smoked at follow-up. The intervention and location of school were not significantly related to the probability of remaining a never smoker at follow-up.

Table 6.38
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, a random slope for a level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for never smokers (matched data with 1st assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	3.728	0.254	14.650	0.000*	41.603
Intervention=1	0.102	0.205	0.498	0.618	1.107
KKinabalu=1	-0.096	0.194	-0.496	0.620	0.908
Boy=1	-2.342	0.196	-11.947	0.000*	0.096
Hostel=1	0.319	0.027	11.950	0.000*	1.376
SS_parents=1	-0.461	0.106	-4.331	0.000*	0.631
SS_sibling=1	-0.968	0.113	-8.588	0.000*	0.380
Time=1	-0.345	0.142	-2.437	0.015*	0.708
(Intervention=1)*(Time=1)	0.163	0.112	1.459	0.145	1.177
(KKinabalu=1)*(Time=1)	0.043	0.113	0.377	0.706	1.044

Note: Probability distribution:Binomial; Link function:logit

b) Outcome: Ex-smokers/occasional smokers

Null model

In relation to the variance components, the z-test (z=0.438) was not significant and therefore indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0513. Therefore, approximately 5.1% of variability among ex-smokers/occasional smokers was explained by variation between schools.

Model with addition of level-1 predictors

The fixed-effect output shows that the smoking status outcome of ex-smoker/occasional smokers was significantly and positively related to being a boy, staying in a school hostel and having a parent who smoked and having a sibling who smoked. The likelihood of being an ex-smoker/occasional smoker was about 9 times higher for boys. The likelihood of students being an ex- smokers/occasional smokers were about 1.1 times higher for students who stayed in a school hostel. Students who had a parent who smoked were 1.5 times more likely to be an ex-smoker/occasional smoker than students who did not have a parent who smoked. Students who had a sibling who smoked were about 2 times more likely than students who did not have a sibling who smoked to be ex-smokers/occasional smokers.

Model with addition of level-1 predictors and random level-1 slope

The variance in the slope for ex-smokers/occasional smokers (σ^2_s=0.022) was not significant across schools (z=1.227, p>0.05). These results indicated that across schools there was no variation in the relationship between time (at baseline and follow-up) and ex-smokers/occasional smokers.

Model with addition of level-1 and level-2 predictors

Both school level variables were not significantly related to the smoking status of ex-smokers/occasional smokers.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 6.39 shows the model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction for the outcome ex-smoker/occasional smoker. The nominal interactions between time and intervention (time*intervention) and between time and location (time*KKinabalu) were not significant. Thus, being assigned to the intervention arm of the study and the location of school were not significantly related to the probability of being an ex-smoker/occasional smoker at follow-up.

Table 6.39
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, a random slope of level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for ex-smoker/occasional smokers (matched data with 1st assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	-3.724	0.295	-12.619	0.000*	0.024
Intervention=1	-0.314	0.309	-1.017	0.309	0.731
KKinabalu=1	-0.087	0.295	-0.296	0.767	0.916
Boy=1	2.198	0.229	9.612	0.000*	9.006
Hostel=1	0.100	0.041	2.463	0.014*	1.105
SS_parents=1	0.432	0.095	4.538	0.000*	1.540
SS_sibling=1	0.718	0.052	13.934	0.000*	2.051
Time=1	0.123	0.136	0.905	0.365	1.131
(Intervention=1)*(Time=1)	0.129	0.164	0.785	0.432	1.138
(KKinabalu=1)*(Time=1)	-0.024	0.166	-0.145	0.885	0.976

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly)

Null model

In relation to the variance components, the z-test (z=0.708) was not significant which indicated that the intercept variance did not vary between schools. The ICC was 0.0156. Thus, approximately 1.6% of variability among regular smokers (monthly) was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that the smoking status of regular smokers (monthly) at follow-up was significantly and positively related to being a boy, and having a sibling who smoked and significantly but negatively associated with staying in a school hostel.
The odds of being a regular smoker (monthly) were about 10 times higher for boys than girls at follow-up. Students who had a sibling who smoked were about 2.7 times more likely to be a regular smoker (monthly) than students who did not have a sibling who smoked.

The log odds of being regular smokers (monthly) among students who stayed in the school hostel during school term were reduced by 2.587 units (β= -2.587) when the other predictors were held at constant. The odds of students who stayed in school hostel for being regular smokers (monthly) were 92.5% lower than for those who did not stay in school hostel. Students who did not stay in the school hostel were 13 times more likely than students who did stay in school hostel to be regular smokers (monthly).

Model with addition of level-1 predictors and random level-1 slope

The variance in the slope (σ^2_s=0.078) across schools for regular smokers (monthly) was not significant (z=1.264, p>0.05) which indicated that across schools there was no variation in relationship between time (at baseline and follow-up) and regular smokers (monthly).

Model with addition of level-1 and level-2 predictors

Attending school in the District of Kota Kinabalu, which represented the urban population, was positively and significantly related the probability of being a regular smoker (monthly). Schools in the District of Kota Kinabalu increased the log odds of being regular smokers (monthly) by 0.035 units (γ_{01}=0.035, p<0.05), when the other effects were held at constant. Students attending school in the District of Kota Kinabalu were 1.4 times more likely to be regular smokers (monthly). The school allocation to intervention and control schools was not significantly related to the probability of remaining a regular smoker (monthly).

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

The nominal interaction between (time*intervention) indicated that being a regular smoker (monthly) at follow-up was significantly related to the relationship between time and allocation of school to the intervention and control arms of the study. The log odds of students who were regular smokers (monthly) at follow-up in intervention schools were -6.632 (-5.680+0.508-0.818=-5.99), with the odds ratio then $e^{-5.99}$ or 0.002504. The log odds of students who were regular smokers (monthly) at follow-up in control schools were -5.435 (-5.680+0.508=-5.172) and the odds ratio ($e^{-5.172}$) were 0.005673. Thus, the odds ratio for the effect of the interaction between time and the intervention on the probability of being a regular smoker at follow-up was 0.441. Alternatively, at follow-up, students attending control schools were 2.3 times more likely than students attending intervention schools of being regular smokers (monthly) at follow-up. The interaction between time and location of school was not significant (Table 6.40).

Table 6.40
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, slope of level-1 variable and the cross interaction of the level-1 and level-2 variables for regular smokers (monthly)(matched data with 1st assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	-5.680	0.287	-19.813	0.000*	0.003
Intervention=1	0.508	0.200	2.546	0.011*	1.663
KKinabalu=1	0.368	0.243	1.516	0.130	1.445
Boy=1	2.262	0.300	7.534	0.000*	9.603
Hostel=1	-2.432	0.672	-3.616	0.000*	0.088
SS_parents=1	0.166	0.213	0.781	0.435	1.181
SS_sibling=1	0.975	0.226	4.312	0.000*	2.651
Time=1	0.769	0.212	3.631	0.000*	2.158
(Intervention=1)*(Time=1)	-0.818	-3.527	-3.527	0.000*	0.441
(KKinabalu=1)*(Time=1)	-0.012	0.231	-0.053	0.958	0.988

Note: Probability distribution:Binomial; Link function:logit

6.9.3.3 Matched data with 2nd assumption

In the matched data set with 2nd assumption, there were 3904 observation from 1952 students

a) Outcome: Never smokers

Null model

When the log odds of the intercept predictor was converted to the average school-level probability, the probability of never smoker students was estimated as [1/ (1+$e^{-(1.226)}$)] or 0.7731 (77.3%). The estimated probability was larger than the probability in the single level analysis without predictors (76.9%). The estimated probability represented the average school-level outcome as opposed to the average individual-level outcome.

In relation to the variance components, the z-test (z=1.376) was not significant which indicated that the intercept variance did not vary between schools. The ICC was 0.0197. Thus, approximately 2.0% of variability among never smokers was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that the outcome of never smoker at follow-up was significantly and negatively associated with being a boy, having a parent who smokes, having a sibling who smokes and time and significantly but positively related to staying in a school hostel during the school term.

Being boys reduced the log odds of remaining a never smoker by -1.734 units (β=-1.734), when the other effects were held constant. Exponentiating the log odds resulted in an odds ratio of 0.177. Thus, the odds of remaining a never smoker were decreased for boys by about 82.3%. Alternatively boys were about 5.6 times more likely than girls to be ever

smokers at follow-up.

Having a parent who smoked reduced the log odds of never smokers by 0.373 units (β=-0.373), when the other effects were held constant. The odds ratio was 0.688 and the odds of being a never smoker for students who had a parent who smoked were about 31.1% lower than for students who did not have a parent who smoked. Alternatively students who had a parent who smoked were 1.5 times more likely to be ever smokers at follow-up. In addition, having smoker siblings reduced the log odds of never smokers by 0.655 units (β=-0.655), when the other effects were held constant. The odds ratio of remaining a never smoker at follow-up was about 48% lower for students who had a sibling who smoked. Students who had a sibling who smoked were 1.9 times more likely to be ever smokers at follow-up. The log odds of never smokers at follow-up were reduced by 0.791 units (β=-0.791), holding the other effects at constant. The probability of being a never smoker at follow-up was decreased by about 54.7%. Alternatively students at baseline were 2.2 more likely than students at follow-up to be never smokers.

Staying in a school hostel increased the log odds of being a never smoker at follow-up by 0.370 units (β= 0.370), when the other effects were held constant. Students who stayed in school hostel during school term were about 1.4 times more likely to remain never smokers at follow-up or had an increase likelihood of remaining as a never smoker of about 56.8%.

Model with addition of level-1 predictors and random level-1 slope

The variance across schools in random slopes for never smokers (σ^2_s=0.013) was not significant (z=1.039, p>0.05). These results suggested that there was no variation across schools in the relationships between time (at baseline and follow-up) and never smokers.

Model with addition of level-1 and level-2 predictors

The fixed-effect output for never smoking at follow-up indicated that the estimators for level-1

predictors remained about the same. The allocation to the intervention and control arms of the study and location of schools were not significantly related to the probability of remaining a never smoker.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

The nominal interactions between time and intervention (time*intervention) and between time and location (time*KKinabalu) were not significant. Allocation to the intervention arm and location of school were therefore not significantly related to the probability of remaining a never smoker at follow-up (Table 6.41).

Table 6.41
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, slope of level-1 variable and the cross interaction of the level-1 and level-2 variables for never smokers (matched data with 2nd assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	3.070	0.267	11.500	0.000*	21.546
Intervention=1	0.113	0.192	0.591	0.555	1.120
KKinabalu=1	-0.134	0.177	-0.758	0.449	0.875
Boy=1	-1.727	0.221	-7.823	0.000*	0.178
Hostel=1	0.399	0.091	4.392	0.000*	1.491
SS_parents=1	-0.374	0.131	-2.851	0.004*	0.688
SS_sibling=1	-0.646	0.065	-9.921	0.000*	0.524
Time=1	-0.953	0.088	-10.767	0.000*	0.386
(Intervention=1)*(Time=1)	0.141	0.117	1.212	0.226	1.152
(KKinabalu=1)*(Time=1)	0.178	0.115	1.552	0.121	1.195

Note: Probability distribution:Binomial; Link function:logit

b) Outcome: Ex-smokers/occasional smokers

Null model

In relation to the variance components, the z-test (z=0.430) was not significant and therefore indicated that the intercept variance did not vary between schools. The ICC was 0.0469. Therefore, approximately 4.7% of variability among ex-smokers/occasional smokers was explained by variation between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that being an ex-smoker/occasional smoker at follow-up was significantly and positively related to being a boy, staying in a school hostel, having a parent who smoked and having a sibling who smoked. The odds of being an ex-smoker/occasional smoker were about 9 times higher for boys than girls.

The log odds of being an ex-smoker/occasional smoker for students who stayed in the school hostel during school term were lower by 0.208 units (β=0.208) when the other effects were held at constant. The odds of students being an ex- smoker/occasional smoker were about 1.2 times higher for students who stayed in a school hostel.

Students who had a parent who smoked were about 1.5 times more likely to be an ex-smoker/occasional smoker at follow-up. Students who had a sibling who smoked were about 2 times more likely to be ex-smokers/occasional smokers at follow-up.

Model with addition of level-1 predictors and random level-1 slope

The variance in the random slope for ex-smokers (σ^2_s=0.033) was not significant across schools (z=1.086, p>0.05). These results indicated that there was no variation across schools in the relationship between time (at baseline and follow-up) and ex-smokers/ occasional smokers.

Model with addition of level-1 and level-2 predictors

Neither school level variable was significantly related to the smoking status of ex-smokers/occasional smokers.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

The coefficients of both of the nominal interactions between time and intervention

(time*intervention) and between time and location (time*KKinabalu) were not significant. Thus, the intervention and location of school were not significantly related to the probability of being an ex-smoker/occasional smoker at follow-up (6.42).

Table 6.42
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, random slope of level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for ex-smokers/occasional smokers (matched data with 2nd assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	-3.686	0.294	-12.520	0.000*	0.025
Intervention=1	-0.306	0.305	-1.005	0.315	0.736
KKinabalu=1	-0.074	0.289	-0.255	0.798	0.929
Boy=1	2.156	0.227	9.485	0.000*	8.638
Hostel=1	0.179	0.068	2.627	0.009*	1.196
SS_parents=1	0.414	0.085	4.867	0.000*	1.513
SS_sibling=1	0.686	0.084	8.177	0.000*	1.986
Time=1	-0.228	0.167	-1.364	0.173	0.796
(Intervention=1)*(Time=1)	0.148	0.220	0.674	0.500	1.160
(KKinabalu=1)*(Time=1)	-0.035	0.218	-0.159	0.874	0.966

Note: Probability distribution:Binomial; Link function:logit

c) Outcome: Regular smokers (monthly)

Null model

In relation to the variance components, the z-test (z=0.744) was not significant which indicated that the intercept variance did not vary between schools. The ICC was calculated as 0.0054. Thus, approximately 0.5% of the variability among regular smokers (monthly) was explained by variability between schools.

Model with addition of level-1 predictors

The fixed-effect output indicated that being a regular smoker (monthly) at follow-up was significantly and positively related to being a boy, having a sibling who smoked and time at baseline and follow-up and additionally, significantly but negatively related to staying in a school hostel during term time. Boys were about 3 times more likely than girls to be a regular smoker (monthly) at follow-up.

Having siblings who smoked increased the log odds of being regular smokers (monthly) at follow-up by 0.387 units (β=0.387) when the other effects were held at constant. The odds of regular smokers (monthly) who had siblings who smoked were about 59.6% higher. Students who had a sibling who smoked were about 1.5 times more likely to a regular smoker (monthly) at follow-up than students who did not have a sibling who smoked.

The probability of being a regular smoker (monthly) at follow-up was about 5.5 times higher than being a regular smoker (monthly) at baseline. Students who did not stay in a school hostel were 2.5 times more likely than students who stayed in a school hostel to be regular smokers (monthly) at follow-up.

Model with addition of level-1 predictors and random level-1 slope

The variance in the random slope for regular smokers (monthly) (σ^2_s=0.034) was not significant across schools (z=1.051, p>0.05). These results showed that across schools there was no variation in the relationship between time (at baseline and follow-up) and regular smokers (monthly).

Model with addition of level-1 and level-2 predictors

The intervention and school location were not significantly related to the probability of remaining a regular smoker (monthly) at follow-up.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

The nominal interaction between (time*intervention) was significantly associated with being a regular smoker (monthly) at follow-up. The log odds of students who were regular smokers (monthly) at follow-up in intervention schools were -5.599 (-4.540+0.417-0.642=-5.599), with the odds ratio then $e^{-5.599}$ or 0.003702. The log odds of students who were regular smokers

(monthly) at follow-up in control schools were -4.957 (-4.540+0.417=-4.957) and the odds ratio ($e^{-4.957}$) were 0.007033. Thus, the odds ratio for the interaction of being regular smokers at follow-up between students in intervention schools and control schools was 0.526. Therefore, at follow-up, students were 1.9 times more likely to be regular smokers (monthly) in control schools than in intervention schools. The nominal interaction between (time*KKinabalu) was not significantly associated with the probability of being a regular smoker (monthly) at follow-up (Table 6.43).

Table 6.43
Final fixed effects model with random intercept and random slope: Adding level-1 and level-2 variables, the random slope of level-1 variable (time) and the cross interaction of the level-1 and level-2 variables for regular smokers (monthly) (matched data with 2nd assumption)

Model term	Coefficients	Std. error	t	Sig.	Exp(coefficient)
Intercept	-4.540	0.263	-17.264	0.000*	0.011
Intervention=1	0.417	0.206	2.027	0.043*	1.517
KKinabalu=1	0.414	0.242	1.714	0.087	1.514
Boy=1	1.110	0.166	6.699	0.000*	3.034
Hostel=1	-0.909	0.238	-3.812	0.000*	0.403
SS_parents=1	0.185	0.155	1.197	0.231	1.204
SS_sibling=1	0.381	0.076	5.043	0.000*	1.464
Time=1	2.305	0.140	16.429	0.000*	10.028
(Intervention=1)*(Time=1)	-0.642	0.187	-3.430	0.001*	0.526
(KKinabalu=1)*(Time=1)	-0.416	0.220	-1.891	0.059	0.659

Note: Probability distribution:Binomial; Link function:logit

6.9.3.4 Summary on impact of intervention on smoking status using multilevel analysis with random intercept and random slope for matched participants.

Table 6.44 summarises the findings from the multilevel analyses that had a random intercept and random slope for matched participants using the matched data set, the data set based on the first assumption and the data set based on the second assumption.

The ICC which provides an indication of the variability of the different categories of smoking status at follow-up that arises as a consequence of variability between schools was very low for all smoking behaviour outcomes at follow-up regardless of which data set was used. The

range for ICC for never smokers in all data set at follow-up was approximately between 2.0% and 3.9%. The ICC range for ex-smokers/occasional smokers was between 4.2% and 5.1%. The ICC range for regular smoking at follow-up was between 0.5% and 2.0%.

The addition of level-1 (individual level) predictors to the analysis showed similar patterns for all data sets. Boys and students who had a sibling who smoked were significantly less likely to remain never smokers at follow-up but significantly more likely to be ex-smokers/occasional smokers and regular smokers (monthly) at follow-up. Students who had a parent who smoked were also significantly less likely to remain a never smoker at follow-up but significantly more likely to become an ex-smoker/occasional smoker at follow-up. However having a parent who smoked did not appear to be significantly associated with regular smoking at follow up. Students who stayed in a school hostel during the school term were significantly more likely to remain never smokers and be ex-smokers/occasional smokers at follow-up but significantly less likely to be regular smokers (monthly) at follow-up. The smoking status of never smoker and regular smoker (monthly) were both significantly related to time at baseline and follow-up. Generally, students at follow-up were significantly less likely to be never smokers but significantly more likely to be regular smokers (monthly). The addition of a level-1 slope showed no variation in the relationship between time at baseline and follow-up and all smoking statuses across schools in all data sets.

The only significant association between location of school and smoking status at follow-up occurred when the outcome was regular smoking at follow-up and the data set that was used was based on the first assumption. The first assumption is where baseline students who are missing at follow-up are assumed to have retained their baseline smoking status. Living in the District of Kota Kinabalu which is an urban district appeared to significantly and positively influence the likelihood of being a regular smoker (monthly) at follow-up.

The intervention was significantly and negatively associated with being a regular smoker

(monthly) in all the analyses that involved a random level-1 slope (time) irrespective of the data set that was used. Thus, students in intervention schools were significantly less likely to be regular smokers (monthly) at follow-up.

Table 6.44

Summary of results on the impact of intervention on smoking status using multilevel analysis with random intercept and random slope for matched participants

Data	Outcome	Significant factors				
		Null	Level-1	Level -1 slope (Time)	Level-2	Level-2 slope (Time)
A) Matched data	i) Never smokers	Intercept (+ve) ICC:3.9%	Boy (-ve)* Hostel (+ve)* Parent (-ve)* Sibling (-ve)* Time (-ve)*	-	-	-
	ii) Ex-smokers/ occasional smokers	Intercept (-ve) ICC: 4.2%	Boy (+ve)* Hostel (+ve)* Parent (+ve)* Sibling (+ve)*	-	-	-
	iii) Regular smokers (monthly)	Intercept (-ve) ICC:2.0%	Boy (+ve)* Hostel (-ve)* Sibling (+ve)* Time (+ve)*	-	-	(Intervention) *(Time) (-ve)*
B) Matched data with 1st Assumption	i) Never smokers	Intercept (+ve) ICC:3.5%	Boy (-ve)* Hostel (+ve)* Parent (-ve)* Sibling (-ve)* Time (-ve)*	-	-	-
	ii) Ex-smokers/ occasional smokers	Intercept (-ve) ICC: 5.1%	Boy (+ve)* Hostel (+ve)* Parent (+ve)* Sibling (+ve)	-	-	-
	iii) Regular smokers (monthly)	Intercept (-ve) ICC:1.6%	Boy (+ve)* Hostel (-ve)* Sibling (+ve)*	-	K Kinabalu (+ve)	(Intervention) *(Time) (-ve)*
C) Matched data with 2nd Assumption	i) Never smokers	Intercept (+ve) ICC:2.0%	Boy (-ve)* Hostel (+ve)* Parent (-ve)* Sibling (-ve)* Time (-ve)*	-	-	-
	ii) Ex-smokers/ occasional smokers	Intercept (-ve) ICC: 4.7%	Boy (+ve)* Hostel (+ve)* Parent (+ve)* Sibling (+ve)*	-	-	-
	iii) Regular smokers (monthly)	Intercept (-ve) ICC:0.5%	Boy (+ve)* Hostel (-ve)* Sibling (+ve)* Time (+ve)*	-	-	(Intervention) *(Time) (-ve)*

Note:( ) : Coefficient ; *: significant

CHAPTER 7

EVALUATION OF INTERVENTION ON SMOKING INTENTION ACCORDING TO THE THEORY OF PLANNED BEHAVIOUR

7.1 Overview

Chapter 6 focuses on an evaluation of the impact of the peer educator intervention on student attitudes and perceptions in relation to their smoking-related intentions. This evaluation was driven by the Theory of Planned Behaviour (TPB).

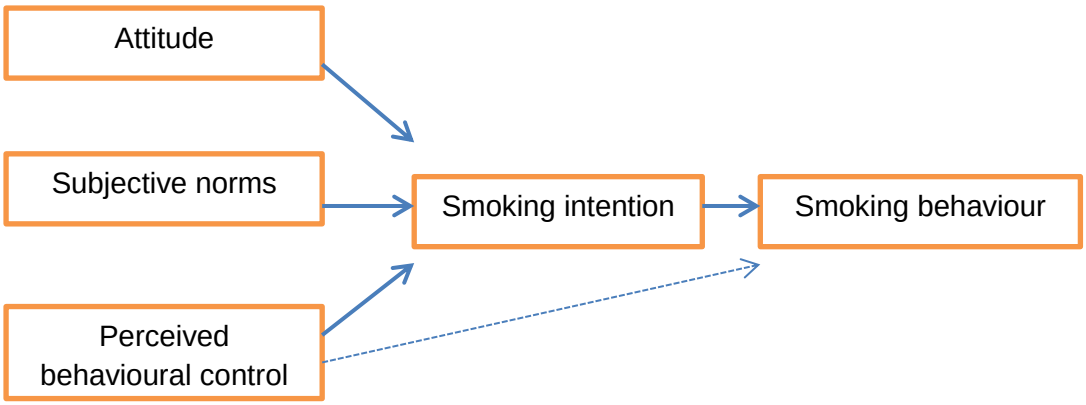
7.2 The Theory of Planned Behaviour (TPB)

The TPB was developed by Ajzen (2002) to explain planned behaviour (figure 7.1). According to the TPB, behavioural intentions are generally regarded as the most proximal and strongest predictors of human behaviour. Behavioural intention, in turn, is predicted by three distal factors; attitudes, subjective norms (SN) and perceived behavioural control (PBC). Behavioural intention is not perfectly related to actual behaviour. However, behavioural intention maybe used as a proximal measure of behaviour (Centre for Health Services Research University of Newcastle, 2004), Therefore measures of behavioural intention may be used when aiming to assess the effectiveness of an intervention without measuring the effect of the intervention on actual behaviour.

I developed a questionnaire that was based on the TPB to use at baseline and follow-up in order to assess the impact of the intervention. After developing the questionnaire, I tested it for internal consistency (reliability analysis) and conducted confirmatory factor analysis in order to assess its properties. Further analyses were then conducted using my final questionnaire. These analyses focus on comparisons between intervention and control schools in relation to the mean scores for a) attitudes, b) subjective norms, c) perceived behavioural control and d) smoking intentions.

Figure 7.1

The theory of Planned Behaviour (Ajzen,2002)



7.3 Structure of the questionnaires that were developed according to the TPB

As mentioned in chapter 3, I drew on a manual which was produced by the Centre for Health Services Research University of Newcastle (2004) in order to construct my TPB questionnaire. I divided the questionnaire into four sections; three sections focused on the three distal predictors (attitudes, subjective norms, perceived behavioural control) and one section focussed on the outcome (intention). For each predictive component, the questions were either direct or indirect measurements.

Attitude is an expression of beliefs for or against the behaviour and the consequences of choosing to undertake the behaviour. There were nine questions on attitudes, three questions were direct measures and another six questions were related to indirect measures. Each indirect measure had two questions the first question was based on a behavioural belief (BB) the second question was based on an outcome evaluation (OE). The behavioural belief and outcome evaluation questions for each indirect measurement were compatible with one another.

Subjective norms are indirect measures that focus on beliefs that are related to perceived social pressure. Subjective norms have two components; normative beliefs (NB) and

motivation to comply (MC). Normative beliefs refer to the wishes of a person or people (e.g. friends) who is/are the subject of the subjective norms in relation to the behaviour and whether the person or people want the respondent to engage in the behaviour. Motivation to comply refers to the respondent's motivation to comply with those wishes. The number of questions concerning subjective norms was similar to the number that focussed on attitudes.

Perceived behavioural control refers to the individual's perception about his/her ability to perform the behaviour or abstain from the behaviour. There were ten questions on perceived behavioural control, four questions focussed on direct measures and the other six questions focussed on indirect measures. The questions that related to indirect measures were divided into control beliefs (CB) and influence of control beliefs (ICB). The CB and ICB each had three questions.

The smoking intention as outcome was composed of three questions.

For each predictor (attitudes, subjective norms, perceived behavioural control) and the outcome (behavioural intention), positive scores reflect anti-smoking beliefs and negative scores reflect pro-smoking beliefs

7.4 Reliability analysis

I performed reliability analyses on the baseline questionnaire in order to assess the internal consistency of the questions that related to each predictor (attitudes, subjective norms and perceived behavioural control) and the outcome (behavioural intention). Reliability analyses produce a value of Cronbach's alpha value. Researchers commonly look for a Cronbach's alpha value that is greater than 0.6. When the Cronbachs alpha value is less than 0.6 this indicates that the internal consistency of the questions is poor. All the direct measurements were derived from semantic differential scales that contained seven categories.

Attitudes had nine items, three of which were direct measurements and six of which were. The direct attitude measures were all based on the stem 'if I were to be a smoker, this would be an …thing to do': '*extremely good*' (1) to '*extremely bad*' (7); '*extremely pleasant*' (1) to '*extremely unpleasant*' (7) and '*extremely useful*' (1) and '*extremely unuseful*' (7). The indirect attitude measures were derived from three sets of behavioural beliefs plus outcome evaluations. The statements on behavioural beliefs were: 'If I were to smoke, I would feel that I am doing something that is not beneficial for me', 'If I were to smoke I would worry about it' and 'If I were to smoke I would feel that this would harm my health'. All the behavioural beliefs were measured on a 7-point scale anchored by '*very unlikely*' (1) and '*very likely*' (7). The outcome evaluations were: 'Feeling that smoking is beneficial is extremely undesirable', 'Feeling worried about smoking is extremely desirable' and 'Thinking that smoking is harmful to your health is extremely desirable'. The outcome evaluations were measured on bipolar 7-point scales, anchored by '*strongly disagree*' (-3) to '*strongly agree*' (+3). The overall value for each attitude indirect measure was obtained by multiplying the behavioural belief value by the related outcome evaluation value. The total attitudes scores in my sample ranged from 20 to 63. The Cronbach's alpha for the direct measures of attitudes was 0.84 and the Cronbach's alpha for the indirect measures of attitudes was 0.74.The internal consistency of both measures may therefore be described as good.

The subjective norms contained two questions that were direct measurements and four questions that were indirect measurements. The two direct subjective norm measures were 'Most people who are important to me think that I should be a non-smoker' and 'It is expected of me that I will not smoke in the future'. Both questions were measured on 7-point scales anchored by '*strongly disagree*' (1) to '*strongly agree'* (7). Indirect subjective norm measures were based on two normative beliefs and two motivations to comply. The normative beliefs were: 'Friends think I should be a non-smoker' and 'My classmates would disapprove if I started smoking' whereas the motivation items were: What my friends think as to whether or not I smoke is important to me and 'What my classmates think I should do in

relation to smoking matters to me'. The normative beliefs were measured on 7-point scales scored from 'very unlikely' (1) to 'very likely' (7). The motivations to comply were measured on bipolar 7-point scales, anchored by '*strongly disagree*' (-3) to '*strongly agree*' (+3). The overall value for each indirect subjective norm measure was obtained by multiplying the normative belief value by the related motivation to comply value. The total subjective norms scores in my sample ranged from 6 to 42. The Cronbach's alpha for the direct measurements of the subjective norms was 0.79 and the internal consistency may consequently be considered to be good. The Cronbach's alpha for the indirect measurements was 0.60 and the internal consistency may consequently be considered to be acceptable.

The perceived behavioural control assessment contained two questions that were direct measurements and another four questions that were related to indirect measurements. The direct measurement questions were 'I am confident that I could be non-smoker, if I wanted to be a non-smoker' and 'For me to be a non-smoker would be easy'. Both questions were again measured on 7-point scales anchored by '*strongly disagree*' (1) to '*strongly agree'* (7). The two control beliefs for the indirect perceived behavioural control measures were: 'People of my age start smoking because their friends smoke' and 'People my age who start to smoke are pressured to smoke'. The control belief items were measured on 7-point scales scored from '*very likely'* (1) to *'very unlikely'* (7). The two influence of control belief items were: 'If my friends started smoking I would find it much more difficult not to smoke' and 'If I felt pressured to smoke I would find it much more difficult not to smoke'. The influence of control beliefs were measured on bipolar 7-point scales *'strongly agree'* (-3) and *'strongly disagree'* (+3). In order to get the overall value for each indirect perceived behavioural control measure, each control belief value was multiplied by the value of the related influence of control belief. The total perceived behavioural control scores in my sample ranged from 6 to 42. The Cronbach's alpha for the direct perceived behavioural control measures was 0.68 and the Cronbach's alpha for the indirect perceived behavioural control

measures was 0.66. These values indicate the internal consistency for both the direct and indirect perceived behavioural control measures was acceptable.

There were three behavioural intention questions in the questionnaire: I (expect/want/intend) to be a non-smoker. All items were measured on 7-point scales, anchored by '*strongly disagree'* (1) to '*strongly agree'* (7). The Cronbach's alpha for intention was high, 0.92 indicating the internal consistency was excellent. The total behavioural intention scores in my sample ranged from 3 to 21. Table 7.1 summarizes the included questions together with their related Cronbach alpha values.

Table 7.1
The internal reliability of the questionnaire

Construct Measure			**Questionnaire**	**Cronbach alpha's**
Attitude	Direct Measurement	Attitude	• If I were to be a smoker, this would be an…thing to do • If I were to be a smoker, this would be an … thing to do • If I were to be a smoker, this would be an… thing to do *Response : extremely good/ extremely not good*	0.84
	Indirect Measurement	Behavioural belief (BB)	• If I were to smoke, I would feel that I am doing something not beneficial for me. • If I were to smoke I would worry about it. • If I were to smoke I would feel that this would harm my health. *Response: very unlikely/ very likely*	0.74
		Outcome evaluation (OE)	• Feeling beneficial about smoking is extremely undesirable. • Feeling worried about smoking is extremely desirable. • Thinking that smoking is harmful to your health is extremely desirable. *Response: strongly disagree / strongly agree*	
Subjective norm	Direct Measurement	Subjective norm	• Most people who are important to me think that I should be a non-smoker. • It is expected of me that I will not smoking in the future. *Response: strongly disagree / strongly agree*	0.79
	Indirect Measurement	Normative belief (NB)	• Friends think I should be a non-smoker. • My classmates would disapprove if I started smoking. *Response: very unlikely/ very likely*	0.60
		Motivation to comply (MC)	• What my friends think as to whether or not I smoke is important to me. • What my classmates think I should do in relation to smoking matters to me. *Response: strongly disagree / strongly agree*	
Perceived behavioural control	Direct Measurement	Perceived behavioural control	• I am confident that I could be non-smoker, if I wanted to be a non-smoker. • For me to be a non-smoker would be easy. *Response: strongly disagree / strongly agree*	0.69
	Indirect Measurement	Control belief	• People of my age who start smoking because their friends smoke • People my age who start to smoke are pressured to smoke *Response: very unlikely/ very likely*	0.66
		Influence of control belief	• If my friends started smoking I would find it much more difficult not to smoke. • If I felt pressured to smoke I would find it much more difficult not to smoke. *Response: strongly disagree / strongly agree*	
Behavioural Intention			• I expected to be a non-smoker • I want to be a non-smoker • I intend to be a non-smoker *Response: strongly disagree / strongly agree*	0.92

A number of questions were removed following the assessment of the internal consistency of the questionnaire (Table 7.2)

Table 7.2
Removed questionnaire

Construct Measure			**Questionnaire**
Subjective norm	Direct Measurement	Subjective norm	• I feel under pressure to smoke *Response: strongly disagree / strongly agree*
	Indirect Measurement	Normative belief (NB)	• Most other people my age smoke. *Response: very unlikely/ very likely*
		Motivation to comply (MC)	• Doing what other people my age do regarding smoking is important to me. *Response: strongly disagree / strongly agree*
Perceived behavioural control	Direct Measurement	Perceived behavioural control	• The decision to smoke or not is beyond my control • Whether I smoke or not is entirely up to me. *Response: strongly disagree / strongly agree*
	Indirect Measurement	Control belief	• If someone offered me a cigarette, I would be tempted to smoke *Response: very unlikely/ very likely*
		Influence of control belief	• If I were offered a cigarette I would be more likely to smoke *Response: strongly disagree / strongly agree*

7.5 Confirmatory factor analysis

The TPB was developed in Western English speaking countries. It is not always possible to accurately transfer meaning and constructs from one culture to another. Translation from one language to another is also not always straightforward. Thus, it was possible that I had developed a questionnaire that had a large numbers of factors that were unrelated to the underlying theory. As a consequence, I conducted confirmatory factor analysis in order to confirm that the hypothesized patterns of loadings were reflected by the actual loading of the factors or components contained in the questionnaire I had constructed. Confirmation would indicate that the questions were related to the identified factors in the way that was hypothesised by the theory and that the questionnaire was thus, based on a well-developed underlying theory. In other words the questions that were hypothesised to be related to each other were as predicted related to each other. This analysis also helped me to avoid subsequent complications that may have arisen had the questionnaire contained large numbers of factors that were unrelated to the underlying theory. I conducted confirmatory factor analysis using direct measurements for attitudes, subjective norms and perceived

behavioural control and, in addition, behavioural intention. This was followed by confirmatory factor analysis using the indirect measurements for attitudes, subjective norms and perceived behavioural control and, in addition, behavioural intention.

7.5.1 Direct measurements

Prior to performing principal component analysis (PCA), I assessed the strength of the inter-correlations among the items to ensure the data were suitable for factor analysis. According to Tabachnick and Fidell (2007), the coefficient value in the correlation matrix should be greater than 0.3. All the items in the correlation matrix had coefficient values that were greater than 0.3. The Kaiser-Meyer-Olkin (KMO) value was 0.91 and the Barlett's test of sphericity showed a significant value ($P<0.001$). The KMO statistic was in excess of 0.6 which indicated that the amount of variance within the data could be explained by factors. Therefore, it was appropriate to carry out the factor analysis.

Factor extraction determined the smallest number of factors that could be used to represent the interrelations among the set of variables. I used the common extraction technique of principal components analysis to force the factors to load onto four components as predicted by the TPB (attitudes, subjective norms, perceived behavioural control and behavioural intention). The pattern matrix was rotated using the varimax rotation or orthogonal rotation. According to Tabachnick and Fidell (2001), results from orthogonal rotations are easier to interpret and to report when it is assumed that the underlying constructs are independent (not correlated). Before the rotation, the distribution of variance among the four components was 55.7% for component 1, 10.4% for component 2, 8.0% for component 3 and 6.7% for component 4. After the varimax rotation, the distribution of variance was adjusted to 22.6% for component 1, 17.0% for component 2, 22.4% for component 3 and 18.8% for component 4. The principal component analysis explained about 80.85% of the total distribution of variance between the four components.

For the rotated component matrix, I used the pattern matrix to confirm the loadings of questions onto four components (Table 7.3). The first component was behavioural intention and the questions were Q16, Q17 and Q18. This was followed by the second component which was perceived behavioural control which was composed of two questions, Q36 and Q37. The third component was the attitudes component which was composed of three questions, Q18, Q19 and Q20. The fourth component was the subjective norms component which had two questions Q27 and Q28.

Table 7.3
Pattern Matrix[a] for direct measurement questions

Item	Component			
	1	2	3	4
BI_Q16	.935			
BI_Q17	.918			
BI_Q15	.908			
PBC_Q37		.900		
PBC_Q36		.823		
A_Q18			-.877	
A_Q20			-.875	
A_Q19			-.831	
SN_Q27				-.934
SN_Q28				-.847

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.[a]
a. Rotation converged in 7 iterations.

7.5.2 Indirect measurement

As in the previous principal component analysis for direct measurements, I again assessed the strength of the intercorrelations among the items to ensure the data were suitable for factor analysis. Most of the items in the correlation matrix for the indirect measurements had a coefficient value less than 0.3. However, the value for Kaiser-Meyer-Olkin (KMO) statistic was 0.68 and according to Kaiser (1970, 1974) this value is acceptable because it is higher than the minimum acceptable value for factor analysis which is 0.6. In addition, the Barlett's test of sphericity showed a significant value ($P<0.001$). Therefore, it was still acceptable to carry out the factor analysis.

I used the same common extraction technique of principal components analysis as in the previous analysis to force the factors to load onto four components, attitudes (indirect measures), subjective norms (indirect measures), perceived behavioural control (indirect measures) and behavioural intention. Then the pattern matrix was rotated using the varimax rotation or orthogonal rotation. Before the rotation, the distribution of variance among the four components was 27.4% for component 1, 16.8% for component 2, 14.8% for component 3 and 13.6% for component 4. After the varimax rotation, the distribution of variance was adjusted to 24.6% for component 1, 18.7% for component 2, 15.2% for component 3 and 14.0% for component 4. The principal component analysis explained about 72.6% of the total distribution of variance between the four components.

For the rotated component matrix, I used the pattern matrix again to confirm the loadings of questions onto four components (Table 7.4). The first component was behavioural intention and the related questions were Q16, Q17 and Q18. This was followed by the second component which was the attitudes component and had six questions, Q21, Q22, Q23, Q24, Q25 and Q26. The third component was perceived behavioural control which was composed of four questions, Q41, Q42, Q44 and Q45. The fourth component was subjective norms which was also composed of four questions Q30, Q31, Q33 and Q34.

Table 7.4
Pattern Matrix[a] for indirect measurement questions

	Component			
	1	2	3	4
BI_Q16	.921			
BI_Q15	.895			
BI_Q17	.891			
A_Q23XQ26		.848		
A_Q22XQ25		.824		
A_Q21XQ24		.665		
PBC_Q42XQ45			-.872	
PBC_Q41XQ44			-.868	
SN_Q31XQ34				.845
SN_Q30XQ33				.842

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.[a]
a. Rotation converged in 4 iterations.

7.6 Comparison between the intervention and control schools in relation to the mean scores for attitudes, subjective norms, perceived behavioural control and intention

I conducted two types of t-test analysis to make comparisons between intervention and control schools in relation to the mean scores of the components of the TPB; the independent t-test analysis and the pair t-test analysis.

7.6.1 Comparison of the mean scores of intervention and control schools at baseline and follow-up using the independent t-test analysis

Table 7.5 shows the results of the independent t-test analysis for the comparison of the mean scores of the TPB components in intervention and control schools at baseline and follow-up. At baseline, the results indicated that the mean scores for behavioural intention and the indirect measurement of perceived control belief were significantly lower in the intervention schools

At follow-up there were no significant differences between intervention and control schools in the mean scores for behavioural intention and perceived behavioural control (indirect measurement). However, the mean scores for perceived behavioural control (direct measurement) and attitude (indirect measurement) were both significantly higher in the intervention schools at follow-up.

Table 7.5
Independent t-test analysis for comparing of the mean scores for intervention and control schools at baseline and follow-up

Components of TPB	Baseline			Follow-up		
	Mean score		p-value	Mean score		p-value
	Intervention schools	Control schools		Intervention schools	Control schools	
Behavioural Intention	6.2742	6.3446	0.030*	6.1763	6.1030	0.171
Direct Measurement						
• **Attitudes**	6.4014	6.4157	0.961	6.2683	6.2735	0.411
• **Subjective norms**	6.2334	6.2708	0.405	6.1158	6.0652	0.067
• **Perceived behavioural control**	6.0368	6.1062	0.746	5.9636	5.7799	0.000*
Indirect Measurement						
• **Attitudes**	5.8021	5.8319	0.994	5.8282	5.6102	0.030*
• **Subjective norms**	5.0226	4.9467	0.769	5.1741	5.1687	0.053
• **Perceived behavioural control**	4.2895	4.3627	0.004*	4.3689	4.2447	0.771

Note:
** -Significant at 95% CI*

7.6.2 Comparison of the mean scores for intervention and control schools at baseline and follow-up using the paired t-test analysis

Table 7.6 shows the paired t-test analyses results for the comparison of the mean scores of TPB components in intervention and control schools at baseline and follow-up.

The only significantly higher mean score at follow-up for intervention schools, focussed on subjective norms (indirect measurement) (5.4094 at follow-up versus 5.1471 at baseline).

In control schools, the mean scores for behavioural intention, perceived behavioural control (direct measurement), attitudes (indirect measurement) were all significantly lower at follow-up. However, the subjective norms (indirect measurement) were significantly higher at follow-up.

Table 7.6
Paired t-test analysis for comparing the mean scores for intervention and control schools at baseline and follow-up

Components of TPB	Intervention schools			Control schools		
	Mean score		p-value	Mean score		p-value
	Baseline (Before)	Follow-up (After)		Baseline (Before)	Follow-up (After)	
Behavioural Intention	6.5508	6.5452	0.912	6.6380	6.4905	0.004*
Direct Measurement						
• **Attitudes**	6.6899	6.6577	0.289	6.7038	6.6755	0.377
• **Subjective norms**	6.5017	6.5011	0.991	6.5518	6.4456	0.067
• **Perceived behavioural control**	6.2874	6.2739	0.802	6.3799	6.0992	0.000*
Indirect Measurement						
• **Attitudes**	6.0649	6.1447	0.065	6.0565	5.9117	0.002*
• **Subjective norms**	5.1471	5.4094	0.000*	5.0667	5.3733	0.000*
• **Perceived behavioural control**	4.3301	4.4235	0.136	4.4020	4.2914	0.108

Note:

** -Significant at 95% CI*

7.7 Impact of the intervention on smoking intention according to the TPB using multilevel analysis and matched data

The impact of the intervention on smoking intention and the predictors of participants' smoking intention was examined using multilevel linear regression analysis. The outcome was smoking intention which was a continuous measure. This analysis was performed because of the study structure design and the potential variability arising from the clustering of students within schools.

7.7.1 Assessing the effects of the intervention on smoking intention using multilevel analysis with random intercepts and slopes and matched data

Analysis Plan

The analysis plan had three steps. First, I created a null model to examine the variation of smoking intention across schools. Second, I then added the variables in level 1 and 2 to show the effects of those variables on the outcome. Third, I made a cross interaction analysis between variables in level 1 and level 2 to determine how the predictors were associated with the intention outcome.

The null model, which did not contain any predictors, provides information on the total number of estimated parameters. Each estimated fixed and random effect is one parameter, the intercept and the randomly varying intercept. The covariance structure described the dimension of the covariance matrix of random effects at the group level. The subject variable confirmed the eight participating schools.

The individual-level (level 1) random intercept model was created by adding the variables from level-1 (individual level). The model dimension indicated that there were nine fixed effects and one random effect. The fixed effects comprised of the intercept and eight predictors that were attitudes, subjective norms, perceived behavioural control, being a boy, school hostel, parent smokers, sibling smokers and time. The first three predictors were continuous data, while the other predictors were binary outcomes.

The school-level (level 2) random intercept model was created by adding a school-level predictor. The level-2 predictor was allocation of the school to intervention and control arms of the study. The model dimension confirms the estimation for total of twelve parameters.

The school-level (level 2) random slope and random intercept model was created because it was predicted, and confirmed, that four predictors from the individual level (attitudes, subjective norms, perceived behavioural control and time) were significantly related to smoking intention at follow-up, This analysis investigated the variability of the random slope (time) across schools. The model dimension confirmed that the estimation for this model was thirteen parameters.

I wanted to examine the effect of the intervention on the distal predictors of the TPB at follow-up (attitudes, subjective norms and perceived behavioural control) with the outcome being smoking intention. To do this I added three cross level interactions (Sch.allocation* Attitude, Sch.allocation*SN, Sch.allocation*PBC) to the fixed-effect portion of the random slope random intercept model.

The Null model

The estimation of the intercept for the fixed effect of the null model, which is also known as the grand mean for the school-level intention outcome was 19.69.

The estimate of the variance component is an estimation of the variance between schools for smoking intention. The proportion of variance in smoking intention between schools was 0.0028. The ICC indicated that about 0.3% of the total variability in smoking intention resulted from variability between schools. The intercept for the null model did not vary significantly across schools (Wald $Z=0.949$, $p>0.05$). Therefore, the variability in intercepts between schools could not be explained by the null model.

Model with addition of level-1 predictors

The relationship between the fixed effect parameters from level-1 and the outcome of smoking intention is shown in the type III tests. The F-ratio in the ANOVA table suggested that participants' smoking intentions, as predicted by the TPB, had significant associations

with participants' attitudes, subjective norms and perceived behavioural control. Students' smoking intentions were also significantly related to time at baseline and follow-up. If the intercept was made equal to 0, the higher the participants' score for attitudes, subjective norms and perceived behavioural control, the higher the participants' intention score not to smoke. However, as students mature and develop the likelihood of them having pro-smoking intentions increases. The increased likelihood of pro-smoking intentions at follow-up was confirmed in the analysis.

Model with addition of level 1 and 2 predictors

The addition of the school-level (level-2) predictor changed the value of the intercept from 6.99 to 7.04. If the intervention school intercept was added to the control school estimate (7.04 +0.11), the figure was 7.15 which was the estimation of intercept when the intervention school was entered as a covariate. The intervention schools were 0.11 of a point lower than the intercept. However, the school-level predictor that was the allocation to intervention school did not have a significant association with smoking intention (γ_{09}=0.1074, p>0.05).

Model with addition of level-1 and 2 predictor and random slope

The inclusion of individual time as randomly varying did not change the estimates in the previous model with a fixed Time-smoking intention slope.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

The cross-level interaction analysis moderated the size of the within-school time-intention slopes. The interaction indicated that the relationship between predictors and the outcome was dependent on the value of a third value.

Table 7.7 shows the final model for the random slope (time) random intercept model with level-1 and level-2 variables and the cross level interactions for estimating the impact of

school allocation (intervention and control school arm of study) on the predictive parameters which in my model were attitudes, subjective norms and perceived behavioural control. Within schools, individual attitudes, subjective norms and perceived behavioural control remained, as predicted, significantly related to smoking intention. The addition of the cross-level interactions to the model suggested that the within-school time-intention slope was different for schools that were allocated to intervention and control arms of the study. However, there were no significant relationships between the cross-level interactions (Sch.allocation* Attitude, Sch.allocation*SN, Sch.allocation*PBC) and the outcome of smoking intention.

Table 7.7
The model of estimating the impact of school allocation (intervention and control schools) and predictive parameters on smoking intention

Parameter	Estimate	SE	df	t	Sig.
Intercept	7.075641	.763971	2667.934	9.262	.000
Sch_allocation	-.177918	1.020214	2523.555	-.174	.862
Score_Attitude	.139580	.013821	3188.873	10.099	.000
Score_SN	.120690	.014024	3342.673	8.606	.000
Score_PBC	.057320	.011856	3306.048	4.835	.000
Boy	-.213288	.120189	1655.446	-1.775	.076
schostel	.233191	.223915	425.367	1.041	.298
Parents_smokers	-.128344	.117501	1662.388	-1.092	.275
Sibling_smokers	.073770	.139967	1632.546	.527	.598
Time	-.373386	.103455	1702.268	-3.609	.000
Sch_allocation * Score_Attitude	-.015169	.018953	3229.339	-.800	.424
Sch_allocation * Score_SN	.016489	.019037	3338.465	.866	.386
Sch_allocation * Score_PBC	.009629	.016808	3298.204	.573	.567

a. Dependent Variable: Intention.

7.7.2 Assessing the effects of the intervention on smoking intention using multilevel analysis with matched data based on selected predictors

As the intervention appeared to have no impact on participants smoking intentions when I used the matched data set, I decided to continue the analyses by conducting sub-group analyses. I was particularly interested in examining whether the impact of the intervention varied according to boy and/or baseline smoking status. I repeated all the steps in the previous multilevel linear regression analyses with the continuous smoking intention outcome.

The predictors in these analyses at the individual level (level-1) were attitudes, subjective norms, perceived behavioural control, boy, staying in a school hostel, a parent who smoked, a sibling who smoked and time. In multilevel analysis in which boys only were selected, I excluded gender as one of the individual-level predictors. In multilevel analysis in which participants were selected according to their baseline smoking status, I excluded the time predictor. There was only one predictor from the school level (level-2) and that was the allocation of school to intervention and control schools.

7.7.2.1 Did the impact of the intervention vary according to gender?

<u>The Null model</u>

The estimation of the intercept for the fixed effects in the null model which is also known as the grand mean for school-level outcome of intention was 19.32. The proportion of variance in smoking intention between schools was 0.0027. The ICC suggested that about 0.3% of the total variability in smoking intention arose because of variability between schools. The intercept did not vary significantly across schools (Wald $Z=0.602$, $p>0.05$). Therefore the variability in intercepts between schools could not be explained through the null model.

Model with addition of level-1 predictors

As observed above participants' smoking intentions were, as predicted by the TPB, significantly associated with participants' attitudes, subjective norms and perceived behavioural control. Smoking intention was also significantly associated with time at baseline and follow-up. At the school-level, participants' scores for intention not to smoke were reduced at follow-up indicating a move away from anti-smoking intentions.

Model with addition of level 1 and 2 predictors

The estimation for the fixed effects when the school-level allocation to the intervention arm of the study was entered as a factor showed that allocation did not significantly affect smoking intention (γ_{08}=0.11, p>0.05) when controlling for the other predictors in the model. The addition of the school-level allocation variable did however change the intercept from 5.78 to 5.83. The intercept in this model represented the mean for intervention schools when control schools was coded as 0 being 0.11 of a point higher. Thus, the intervention schools were 0.11 of a point lower than the intercept.

Model with addition of level-1 and 2 predictor and random slope

The inclusion of individual-level time as randomly varying changed the estimates slightly compared with the previous model where the Time-smoking intention slope was fixed. However, the estimation did not change the fixed effects and covariance parameter.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 7.8 shows the results for the final model for estimating the impact of school allocation (intervention and control schools) on the predictive parameters by selecting only boys for the outcome of smoking intention. Within schools, individual attitudes, subjective norms and perceived behavioural control remained, as predicted by the TPB, significantly related to smoking intention. The addition of the cross-level interactions in the model suggested that

the within-school time-intention slope was different for schools that were allocated to the different arms of the study (intervention and control arms).

The cross level interactions indicated that when male participants only were selected, there was a significant relationship between smoking intention and the attitude and allocation of school (intervention school) interaction. Among boys, as the intention score increased, the scores for the attitudes, subjective norms and perceived behavioural control also increased. The interaction between school allocation (intervention) and attitude had a significant relationship with the smoking intention. However, the increase in attitude scores at follow-up was significantly lower in intervention schools than in control schools.

. **Table 7.8**
The model of estimating the impact of school allocation (intervention and control schools) and predictive parameters on smoking intention by selecting only boys

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	4.459482	.980981	1609.137	4.546	.000
Sch_allocation	2.621488	1.386555	1605.224	1.891	.059
Score_Attitude	.174268	.018680	1654.265	9.329	.000
Score_SN	.133918	.019608	1632.843	6.830	.000
Score_PBC	.065286	.017162	1647.108	3.804	.000
schostel	.127829	.354973	1186.963	.360	.719
Parents_smokers	-.202494	.172565	831.880	-1.173	.241
Sibling_smokers	.050615	.218350	827.724	.232	.817
Time	-.330766	.153779	844.700	-2.151	.032
Sch_allocation * Score_Attitude	-.058824	.026487	1649.058	-2.221	.026
Sch_allocation * Score_SN	-.010956	.027393	1644.629	-.400	.689
Sch_allocation * Score_PBC	.020420	.024884	1652.147	.821	.412

7.7.2.2 Baseline smoking status (never smokers, ex-smokers/occasional smokers and regular smokers (monthly))

The sub-groups in this analysis were based on baseline smoking status. There were three sub-groups baseline never smokers, baseline ex-smokers/occasional smokers and baseline regular monthly smokers.

i) Baseline never smokers

The Null model

The fixed effects intercept or the grand mean for the school-level intention of the null model was estimated as 20.07. The proportion of variance in smoking intention between schools was 0.00186. The ICC suggested that about 0.2% of the total variability in the smoking intention occurred as a result of variability between schools. The intercepts did not vary significantly across schools (Wald Z=0.530, p>0.05). Therefore, the variability in intercepts within and between schools could not be explained through multilevel model.

Model with addition of level-1 predictors

The relationship between the fixed effect parameters from level-1 and the outcome of smoking intention suggested that the participants' smoking intentions were, as predicted by the TPB, significantly associated with participants' attitudes, subjective norms and perceived behavioural control. If the intercept was equal to 0, the higher the participants' score for the attitudes, subjective norms and perceived behavioural control, the higher participants' scores for intention which indicated intentions not to smoke. The intercept was 9.567 which adjusted for the seven predictors and the standard error was 0.824.

Model with addition of level 1 and 2 predictors

The estimation for fixed effects showed that adding the school-level (level-2) predictor (intervention arm of the study) did not affect smoking intentions (γ_{08}=0.210, p>0.05) when the other predictors in the model were controlled for.

Model with addition of level-1 and 2 predictor and random slope

The variability of the slopes across schools was investigated because three individual-level predictors were significantly related to smoking intention. The inclusion of gender as randomly varying changed the estimates slightly when compared with the previous model which had a fixed boy-smoking intention slope. However, the estimation with a random slope did not change the significance pattern of the fixed effects and covariance parameters.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 7.9 shows the final model for estimating the impact of the intervention on the associations between the predictive parameters and smoking intention at follow-up when baseline never smokers only were selected. Within schools, individual attitudes, subjective norms and perceived behavioural control remained, as predicted by the the TPB, significantly related to smoking intention. The addition of the cross-level interactions to the model suggested that the within–school boy-intention slope was different for boys who attended intervention schools when compared to boys who attended control schools. The only significant cross level interaction occurred between allocation of school (intervention school) and perceived behavioural control. Thus, among baseline never smokers, as the score of attitudes and subjective norms increased so did the intention score. In addition the score of perceived behavioural control in intervention schools also increased.

Table 7.9
The model of estimating the impact of school allocation (intervention and control schools) and predictive parameters on smoking intention by selecting baseline never smokers

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	10.550180	1.220526	1315.872	8.644	.000
Sch_allocation	-1.977838	1.608482	1310.015	-1.230	.219
Score_Attitude	.125282	.020653	1435.668	6.066	.000
Score_SN	.083909	.020216	1394.028	4.151	.000
Score_PBC	.012958	.017232	1399.180	.752	.452
Boy	-.140936	.238244	6.571	-.592	.574
schostel	.050817	.322410	331.773	.158	.875
Parents_smokers	-.082281	.157639	1419.399	-.522	.602
Sibling_smokers	.097528	.193186	1401.985	.505	.614
Sch_allocation * Score_Attitude	-.009266	.028277	1432.852	-.328	.743
Sch_allocation * Score_SN	.022472	.027246	1391.739	.825	.410
Sch_allocation * Score_PBC	.049529	.023739	1415.112	2.086	.037

ii) Baseline ex-smokers/occasional smokers

The null model

The fixed effects intercept or grand mean for the school-level intention of the null model was estimated as 19.04. The proportion of variance in smoking intention between schools was 0.0795. The ICC suggested that about 7.9% of the total variability in smoking intention occurred as a result of variability between schools. The intercepts did not vary significantly across schools (Wald Z=1.250, p>0.05). Therefore, the variability in intercepts within and between schools could not be explained through the null model.

Model with addition of level-1 predictors

The relationship between the fixed effect parameters from level-1 and the outcome of smoking intention suggested that the participants' smoking intentions were, as predicted by the TPB, significantly associated with participants' attitudes, subjective norms and perceived behavioural control. If the intercept was equal to 0, the higher the participants' score for the attitudes, subjective norms and perceived behavioural control, the higher participants' scores

for intention. Higher intention scores indicate greater intentions not to smoke. The intercept was 1.646 which was adjusted for the seven predictors and the standard error was 2.470.

Model with addition of level 1 and 2 predictors

The estimation for fixed effects showed that adding the school-level (level-2) predictor (intervention arm of the study) did not affect smoking intentions (γ_{08}=0.014, p>0.05) when the other predictors in the model were controlled for.

Model with addition of level-1 and 2 predictor and random slope

The variability of the slopes across schools was investigated because three individual-level predictors were significantly related to smoking intention. The inclusion of individual gender as randomly varying changed the estimates slightly when compared with the previous model which had a fixed boy-smoking intention slope. However, the estimation did not change the significant pattern of fixed effects and covariance parameters.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 7.10 shows the final model for estimating the impact of the intervention on the associations between the predictive parameters and smoking intention at follow-up when baseline ex-smokers/occasional smokers only were selected. Within schools, individual attitudes and perceived behavioural control remained significantly related to smoking intention. The addition of the cross-level interactions to the model suggested that the within–school boy-intention slope was different for boys who attended intervention schools. There were however, no significant associations between the smoking intention outcome and the interactions between allocation and the three distal predictors of the TPB (attitudes, subjective norms and perceived behavioural control).

Thus, among baseline ex-smokers/occasional smokers, as the score of attitudes, and perceived behavioural control increased so to did the intention score. However, the intervention had no impact on attitudes, subjective norms and perceived behavioural control or smoking intention.

Table 7.10
The model of estimating the impact of school allocation (intervention and control schools) and predictive parameters on smoking intention by selecting baseline ex-smokers/occasional smokers

Parameter	β	SE	df	t	Sig.
Intercept	1.638097	3.236132	76.618	.506	.614
Sch_allocation	2.300090	4.699943	68.204	.489	.626
Score_Attitude	.194045	.056140	124.936	3.456	.001
Score_SN	.106138	.059150	175.718	1.794	.074
Score_PBC	.156518	.050023	136.490	3.129	.002
Boy	-.057236	1.220043	5.831	-.047	.964
schostel	.168014	1.027830	83.087	.163	.871
Parents_smokers	-.216459	.512635	159.856	-.422	.673
Sibling_smokers	.660287	.553296	176.443	1.193	.234
Sch_allocation * Score_Attitude	-.140765	.084506	134.222	-1.666	.098
Sch_allocation * Score_SN	.107161	.089715	174.788	1.194	.234
Sch_allocation * Score_PBC	.029633	.078554	171.868	.377	.706

iii) Baseline regular monthly smokers

The null model

The fixed effects intercept or grand mean for the school-level intention of the null model was estimated as 14.702. The proportion of variance in smoking intention between schools was 0.0364. The ICC suggested that about 3.6% of the total variability in smoking intention occurred as a result of variability between schools. The intercept did not vary significantly across schools (Wald Z=0.012, p>0.05). Therefore, the variability in intercepts within and between schools could not be explained by the null model.

Model with addition of level-1 predictors

The relationship between the fixed effect parameters from level-1 and the outcome of smoking intention suggested that the smoking intentions of participants who were regular smokers at baseline were, as predicted by the TPB, significantly associated with participants' attitudes and subjective norms. The higher the participants' score for attitudes and subjective norms the higher their score for their intention not to smoke. The intercept was 8.356 which were adjusted for the seven predictors and the standard error was 4.521.

Model with addition of level 1 and 2 predictors

The estimation for fixed effects showed that adding the school-level (level-2) predictor (intervention arm of the study) did not affect smoking intentions (γ_{08}=0.378, p>0.05) when the other predictors in the model were controlled for. The addition of the school-level variable changed the intercept from 8.356 to 8.457. The intercept in this model represented the mean for intervention schools when control schools were coded as 0 and was 0.378 of a point higher. The intervention schools were 0.378 of a point lower than the intercept.

Model with addition of level-1 and 2 predictor and random slope

The variability of the slopes across schools was investigated because two individual-level predictors were significantly related to smoking intention, this analysis investigated the variability of slope across schools. The inclusion of individual gender as randomly varying changed the estimates slightly when compared with the previous model which had a fixed boy-smoking intention slope. However, the estimation did not change the significance of the pattern of fixed effects and covariance parameters.

Model with addition of level-1 and 2 predictors, random level-1 slope and cross-level interaction

Table 7.11 shows the final model for estimating the impact of the intervention on the associations between the predictive parameters and smoking intention at follow-up when

baseline regular smokers (monthly) only were selected. Within schools, only individual attitudes remained significantly related to smoking intention at follow-up. The addition of the cross-level interactions to the model suggested that the within–school boy-intention slope was different for boys who attended intervention schools. However, there were no significant associations between the cross level interactions and the intention outcome.

Thus, among baseline regular smokers the intervention had no impact on score of intention, attitude, subjective norms and perceived behavioural control.

Table 7.11
The model of estimating the impact of school allocation (intervention and control schools) and predictive parameters on smoking intention by selecting baseline regular smokers (monthly)

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	-11.754953	6.148918	24.770	-1.912	.068
Sch_allocation	1.352177	9.022520	30.565	.150	.882
Attitude	.404138	.120627	29.740	3.350	.002
SN	.338654	.175782	30.598	1.927	.063
PBC	-.055703	.167390	30.179	-.333	.742
Boy	2.969723	2.916663	5.809	1.018	.349
School hostel	-1.286869	4.299406	26.700	-.299	.767
Parents smokers	-2.509421	1.375019	24.790	-1.825	.080
Sibling smokers	.281309	1.498469	29.131	.188	.852
Sch_allocation * Attitude	-.069753	.183656	29.848	-.380	.707
Sch_allocation * SN	-.152830	.225194	30.899	-.679	.502
Sch_allocation * PBC	.231945	.300660	27.985	.771	.447

a. Dependent Variable: Intention.

7.7.3 Summary on impact of intervention on smoking intention

Table 7.11 is a summary of the results from the multilevel analyses using the linear regression in which the outcome was the smoking intention. The analyses used 1680 matched participants and selected participants based on gender as boys and baseline smoking status. The variables were a combination of binary, continuous and categorical data.

The intercept in the null model was also known as the grand mean of the estimation of the outcome of smoking intention when the other predictors were held at 0. The analyses produced similar patterns for the null models across the different data sets. The ICC varied across the data sets but generally it showed small variation in smoking intention between schools. Across schools, all the intercepts in the null models did not vary significantly, therefore the variability within and between schools could not be explained through the multilevel analyses.

The addition of level-1 predictors into the analysis showed a similar pattern for the matched data and the data which selected only boy. In general, the score of attitudes, subjective norms and perceived behavioural controls were positive and significantly related smoking intention score. The participants favoured intention not to smoke if the smoking intention scored increased. As the participants increased their scores for attitudes, subjective norms and perceived behavioural controls, the score of smoking intention also increased which indicated the participants favoured an intention not smoking. However, smoking intention at baseline and follow-up was also significantly related. In the analysis that used the matched data set and data which selected only boys, the participants at baseline scored significantly lower smoking intention than at follow-up, if the other predictors held at 0. Among selected baseline data for regular smokers (monthly), the outcome for smoking intention was significantly related to the participants scored in attitudes and subjective norms.

The addition of level-1 slope and the level-2 predictors did not show any significant associations with smoking intention. However, among baseline never smokers, the interaction between the intervention and the perceived behavioural control had a positive and significant association with smoking intention. In other words, the intervention had an impact on the perceived behavioural control of participants who were never smokers at baseline and this impact was significantly related to their intention not to smoke.

Table 7.12

Summary of results on the impact of intervention on smoking intention using multilevel linear regression analysis with random intercept and random slope for matched participants

Data	Outcome	Significant factors				
		Null Intercept	**Level-1 variables**	**Level -1 slope (Time/ gender)**	**Level-2 variables**	**Interaction between level-1 and level-2 variables**
i) Matched data	Smoking intention	Intercept (+ve) ICC:0.3%	Intercept(+ve) Attitude(+ve) SN (+ve) PBC (+ve) Time (-ve)	-	-	-
ii) Matched data (only boy)	Smoking intention	Intercept (+ve) ICC:0.3%	Intercept(+ve) Attitude(+ve) SN (+ve) PBC (+ve) Time (-ve)	-	-	-
iii) Matched data (baseline never smokers)	Smoking intention	Intercept (+ve) ICC:0.2%	Intercept(+ve) Attitude(+ve) SN (+ve) PBC (+ve)	-	-	Sch. Allocation (Intervention) * PBC (+ve)
iv) Matched data (baseline ex-smokers/occasional smokers)	Smoking intention	Intercept (+ve) ICC:7.9%	Attitude(+ve) SN (+ve) PBC (+ve)	-	-	-
v) Matched data (regular smokers (monthly))	Smoking intention	Intercept (+ve) ICC:3.6%	Attitude(+ve) SN (+ve)	-	-	-

Note:
( ) : Coefficient

CHAPTER 8

DISCUSSION AND CONCLUSION

8.1 Overview of findings

The main finding of my study was that the intervention had a significant positive effect on the smoking behaviour of baseline current smokers. That is baseline current smokers were less likely to have continued to be current smokers if they attended an intervention school. Five out of the nine statistical analyses I conducted supported this proposal including the most rigorous analyses which were all based on multilevel models**.** The impact of the intervention on baseline never smokers was less obvious as only one of the nine tests of significance indicated that the intervention had a significant positive effect on follow-up never smoking behaviour. At follow-up, the prevalence of regular monthly smokers was lower in intervention schools (2.8%) than in control schools (5.7%). In the statistical analysis that indicated the intervention positively and significantly affected the smoking behaviour of baseline never smokers, the proportion of baseline never smokers who remained as never smokers at follow-up was significantly higher in intervention schools (97%) than in control schools (94%). In relation to baseline occasional smokers only two of the nine analyses indicated that the intervention had a significant positive effect on smoking behaviour at follow-up. In the most robust of the two analyses that produced significant results, the proportion of baseline ex-smokers/occasional smokers who were regular smokers (monthly) at follow-up was significantly lower in intervention schools (13%) than in control schools (28%) (Chapter 6).

The observed positive influence of the intervention on the follow-up smoking behaviour of participants who were regularly smoking (monthly) at baseline is consistent with the findings of the ASSIST programme (a peer-led intervention) in which 10,730 students aged between 12-13 years old from 59 schools in South East Wales and the West of England were

followed-up twelve months later (Hollingworth et al., 2012; Campbell et al., 2008). The finding of my study is also supported by another study on a peer-led smoking prevention programme for Romanian adolescents (Lotrean et al., 2010). The robustness of my findings was enhanced by the high response rates, low attrition rate at follow-up and comparison of analyses that used different data sets that were based on various assumptions regarding missing data at follow-up.

Generally, the process evaluation of the peer supporter intervention indicated that the students who were selected and trained to be peer supporters reacted positively to the training. Although the module and management of the peer educator training needs to be improved, the participants rated its overall quality as 4.7 (between 'very good' and 'excellent'). It may, I believe, be deduced from the focus group discussions and the records from the log books, that the participants appeared to be able to practice what they had learned from the peer educator training and successfully undertake their roles as peer educators. This was achieved through providing their opinions and having personal conversations with their classmates (Chapter 5). These activities were carried out informally without the supervision from teachers. Hence, peer education may be an effective method for diffusing health promotion messages (Audrey, Holliday & Campbell, 2006).

Two thirds (n=49) of the seventy three trained peer educators recorded smoking related peer activities in their log books and returned their log books to me (Chapter 5). The total number of activities in the six month follow-up was nearly a thousand (n=903). Giving opinions/advice was the most common activity (40%), having a personal conversation was also popular (23%) followed by having a discussion and helping friends. The analysis on interactions with friends in school showed that the intervention schools (43%) had a significantly higher proportion of students that had had a conversation about smoking issues than control schools (38%) (Chapter 4).

Having outlined the main study findings in the introductory paragraph of this chapter I recap on the study design and further discuss the findings that support the main study findings.

8.2. Study design

My study focussed on a pilot randomized control trial of a school-based smoking prevention intervention in Malaysia with a seven-month follow-up. Eight secondary schools were randomly allocated equally to intervention and control schools. The smoking prevention intervention was based on educating thirteen year old students to be peer supporters so that they could influence their friends and peers in school on issues related to smoking and thereby influence smoking-related intentions and prevent smoking uptake and/or promote smoking cessation. The intervention was underpinned by the social influence approach.

Intention to smoke in the future has consistently been used as a strong predictor of future smoking behaviour (Conrad, Flay, & Hill, 1992; Eckhart, Woodruff, & Elder, 1994). This study drew on the Theory of Planned Behaviour to explain the influence of the peer educator intervention on students' smoking intention. Students' smoking intentions are determined by attitudes, subjective norms and perceived behavioural control which are, in turn, determined by other individual-level factors such as gender, parents' smoking related behaviour and school-level factors. Attitudes are beliefs about smoking/not smoking and the consequences of it. Subjective norms are related to perceived social pressure from friends, parents and siblings to take up or abstain from smoking. The perceived behavioural control refers to the ability of participants as perceived by the participants themselves to not start smoking if they don't want to start smoking.

The attitudes of adolescents regarding smoking may play a role in the decisions of adolescents to not smoke or take up smoking (Unger at al., 1999). Peer influence which is an aspect of subjective norms may play a crucial role in the take-up and maintenance of adolescent smoking behaviour (Mercken, Candel, Willems, & De Vries, 2009; Eiser, Morgan,

Gammage, Brooks, & Kirby, 1991). Trained peer educators contribute to creating and advocating group norms of not smoking with a view to influencing their peers to conform and not smoke or not start smoking in order that they will be liked and accepted by their peers (Mercken, Candel, Willems, & De Vries, 2009). The peer educators believed that being a smoker was a negative image for adolescents (Chapter 7).

The perceived behavioural control component includes self-efficacy to resist smoking if a young person does not want to smoke. Self-efficacy is associated with smoking-related behaviour (Chen, Horner & Percy, 2002; Stacy, Sussman, Dent, Burton, & Flay, 1992). In addition, self-efficacy is an essential concept in Bandura's social cognitive theory, which has also been used to predict and explain smoking behaviour (Bandura, 2004). Chen et al. (2002) found that adolescents who were non-smokers had significantly higher self-efficacy to resist smoking than those who were occasional or regular smokers and occasional smokers had significantly higher self-efficacy to resist smoking than those who were regular smokers.

8.3 Study findings that support the main study findings

One in ten adolescents in this study reported smoking in the past 30 days but one in twenty five participants also reported smoking in the past 7 days (Chapter 4). The prevalence of smoking amongst my study participants is comparable with previous studies of current smoking prevalence among Malaysian adolescents aged below 18 years old which ranged between 2.4% and 29.7% (Chapter 2).

My study found that gender was significantly related to Malaysian adolescent smoking behaviour. Boys were significantly less likely to be never smokers but significantly more likely to be ex-smokers/occasional smokers and regular smokers (monthly and weekly). In the South-East Asian Region, boys are invariably significantly more likely than girls to smoke cigarettes (Warren et al., 2008). This pattern reflects the smoking patterns among Malaysian

adults. However, in most western countries, there are commonly no significant gender differences in the proportion of adolescents who smoke cigarette (Warren et al., 2008).

This study showed that the intention not to smoke was, as predicted by the Theory of Planned Behaviour, positively and significantly related to the attitudes, subjective norms and perceived behavioural control (Chapter 7). Among baseline regular smokers (monthly), the smoking intention at follow-up was only significantly related to attitude and subjective norms (Chapter 6). However, the intervention did not have an effect on smoking intention. Subgroup analysis based on baseline smoking status also showed that the intervention had a positive impact on the perceived behavioural control of never smokers and this positive impact was significantly related to their intention not to smoke.

8.4 Other individual-level factors that affect smoking among Malaysian adolescents

The findings on the smoking status of the participants' parents in this study reflected the findings of the National Health and Morbidity Survey (NHMS) in 2006 where almost half of adult males were smokers (Chapter 2 and Chapter 4). Additionally, the prevalence of cigarette smoking among the mothers of participants (3.3%) was also within the range for adult females in NHMS in 1996 (3.5%) and 2006 (1.6%) (Chapter 2 and Chapter 4). More than one-fifth of participants in this study had siblings who smoked (Chapter 4). This study also showed that 9% of the participants declared that most or all of their relatives were smokers (Chapter 4). Having parents who smoked did not significantly influence the smoking related behaviour of participants at follow-up in my study. This finding was unexpected. I propose that this finding arose because my study participants were relatively young and that parental smoking behaviour will become a significant and important influence on the smoking related behaviour of my study participants as they grow older, develop and mature.

The approximate cost of implementing the peer educator intervention in schools was between £29 and £36 per student which I believe is reasonable. In the ASSIST programme, the cost was estimated as £32 per student (Hollingworth et al., 2012). The cost of running the peer educator training in Malaysia could be reduced in future if it was implemented by an inter-governmental collaboration with relevant government bodies such as the Department of Youth and Sport, the Department of Education and the Department of Women, Family and Community Development. These governmental agencies might help to reduce the cost of transportation and accommodation. In addition, some participants suggested the peer educator training could be conducted whilst camping in a guarded and secured place (Chapter 5) which would also reduce costs.

8.5 School setting for the peer educator intervention

Schools are important social institutions that promote academic attainment, positive behaviour and positive health-related behaviours. They are also potentially valuable settings for smoking prevention interventions as most adolescents attend schools for several years at least. Additionally, it is relatively easy to access students via schools and relatively easy to monitor the implementation of school-based smoking prevention interventions (Markham et al, 2007; Maes & Lievens, 2003). In my study, the smoking related behaviour of adolescents did vary across schools. Smoking behaviour of adolescents in school is affected by smoking related interventions. However, it is also greatly influenced by the management and commitment of the school authority which have the potential to provide students with effective support and control that protects students from smoking (Aveyard et al, 2004).

The analysis of the log book showed that most of the peer educator activities were conducted in the school compound (Chapter 5). Peer educator interventions are considered to be extra-curricular to the school and thereby add value to students' experiences of their schooling. It has been reported that schools that add value to academic achievement, promote positive attitudes towards discipline and promote involvement in extra-curricular

activities are protective against smoking uptake (Conrad, Flay and Hill, 1992). Schools with high value-added scores are also associated with lower incidence of smoking (Markham et al., 2008). Besides problematic drinking behaviour and playing truant, smoking behaviour is one of the indicators of alienation from school which commonly results in poor academic achievement (Maes & Lievens, 2003). Schools that promote student engagement and identification with the school have lower prevalence of student smoking (Markham and Aveyard, 2004). Additionally, students who smoke who attend these schools are more likely to give up smoking (Markham et al., 2007).

The findings of this study have implications for policy, research and practice.

8.6 Implications for policy

This study showed that more than two-thirds of participants have been taught about the dangers and effects of smoking in schools. In addition, more than 80% of participants confessed to being familiar with the smoking prevention activities that were organized by health staff such as attending health talks, seeing posters and reading pamphlets about the dangers of smoking (Chapter 7). The Malaysian government aimed to promote not smoking through the launching of the nationwide '*Tak Nak*' ('Don't Want') mass media anti-smoking campaign. This initiative has been successful in that it has raised awareness about the dangers of smoking. However, having knowledge about the dangers and effects of smoking is not enough to prevent adolescents from taking up smoking or stopping them from smoking once they have started to smoke (Darling et al., 2006).

The social interactions between peers have been identified not only as an important determinant of initiation and continuation of smoking amongst adolescents (Valente et al, 2005; Alexander et al, 2001) but also as a potential mechanism for clinical and public health interventions in preventing adolescents from smoking (Christakis & Fowler, 2008). Preventing adolescents from starting to smoke and delaying smoking initiation should

become or remain a public health priority because the majority of adult smokers began smoking during their adolescent years (Leatherdale et al., 2005; Alexander et al., 2001). It has been suggested that smoking prevention programmes should target parents and siblings during early adolescence (10-12 years) and should then be shifted during mid-adolescence (13-15 years) to focus on adolescents and their dynamic peer environment (Mercken, Candel, Willems, & De Vries, 2009). However, a single approach to prevent smoking may not be solely effective because individuals are at different stages in their development and also in their acquisition of smoking behaviour (Prochaska & Velicer, 1997). Hence school-based peer educator interventions are only one approach that should be implemented in conjunction with other smoking prevention programmes in Malaysia.

8.7. Implications for research

Future school-based smoking prevention programmes might benefit from adopting a gender specific approach. The results of this study suggest that the intervention had an impact on preventing the continuation of smoking among adolescents. Boys were five times more likely than girls to be ex-smokers/occasional smokers and regular smokers at follow-up. Future programmes would also benefit from long term follow-up.

Research should be continued to monitor the smoking behaviour of young people so that practitioners, schools and researchers may have greater insights into young people who are at the greatest risk of smoking onset. A potentially fruitful line of enquiry would aim to identify the school environment factors that encourage tobacco use onset. Greater insights into the individual-level and school-level factors that are associated with smoking uptake would facilitate the targeting of additional and appropriate support for young people at high-risk and high risk schools, This targeting may potentially save time and money, and improve the programme outcomes.

8.8 Implications for practice

The findings of this study are important for a number of reasons. Firstly, it suggests that more than 80% of adolescents mostly aged 13 years old are never smokers in Malaysia. Since the prevalence of smoking varies across schools, some non-smoking students are at higher risk of smoking as a result of the school they attend. The norms of not smoking should be promoted in schools to counteract the influence or pressure from peers to start or continue smoking.

Secondly, it is estimated about 5% of adolescents aged 13 years old are regular monthly smokers. Although it may be difficult and challenging for the non-smoking students to disapprove of their friends' smoking habit, it is possible for a school to prevent students from smoking around the school. In Malaysia, smoking in the school compound is considered as an offence. Some schools have strict smoking policies and students who are caught smoking more than three times are suspended from school. In other schools, students who are caught smoking more than three times receive corporal punishment. A possible alternative approach, I suggest, would be a referral to a 'stop smoking clinic' for students who are caught smoking in schools on more than three occasions. Stop smoking clinics are available in most of the Malaysian government health clinics.

Additionally, as boys are more than 5 times more likely to smoke than in girls, booster programmes that are specifically tailored to meet the needs of boys could be included in schools. Boys who are involved in sports are less likely to smoke so these booster programmes could potentially benefit from having a focus on fitness and sporting skills as well as social skills, motivation and the promotion of self-efficacy against smoking.

8.9 Limitations of the study

This study has some limitations. All of the smoking behaviour data were based on self-reported behaviour of participating students in the questionnaire. However, the validity of

self-reported smoking behaviour by students has been investigated and self-reported smoking-related behaviour is highly correlated with biological indicators providing young people are assured and believe their answers are confidential (Dolcini, Adler and Ginsberg, 1996)

My study was a pilot study. The small number of schools (n=8) limits the power of the study. Future studies should increase the number of schools that are involved in the study which would result in more robust findings in relation to the impact of peer educator interventions on the smoking related behaviour of Malaysian adolescents.

Peer supporters were included in the baseline and follow-up questionnaires. Including the peer educators in the analyses may have influenced the findings as one aim of the peer educator training course was to promote student commitment to non-smoking. Additionally, students who were smokers could only attend the peer educators' course if they agreed to give up smoking. It was not possible to identify the peer educators in the baseline and follow-up questionnaires. Hence, it was not possible to conduct sensitivity analyses.

Another factor that could have influence the findings was that it was not possible to match all the baseline students to follow-up students. The proportion of matched students was quite high (n=1680; 82.5% of baseline participants) but it may be that the students who were not matched may have different characteristics to the matched students in a smoking-related way and this may have affected the findings.

The selection process of the peer educators that was outlined to the counselling teachers was not adhered to in any intervention school. On reflection organizing a student poll may not have been a good idea in a Malaysian context as relatively many students have the same or similar names and the school may have 8 classes. Hence, identifying who has been nominated may not be straightforward. A possible way forward would be teacher

organised student polls a the class level as it would be clearer which students were nominated.

The questionnaire that I developed was not pre-tested and neither was it back translated to assess validity and thereby make sure that questions accurately reflected the constructs that I aimed to assess. The low value of Cronbach's α for the attitude's questions found in this study highlights a potential weakness in the data collection instrument. However, when the items were removed, the overall reliability improved. Nevertheless, future questionnaires would benefit from back translation of the questionnaires. Back translation raises the likelihood that what the researcher perceives is being asked in the questionnaire reflects what the young people themselves perceive is being asked in the questionnaire.

Another limitation is the follow-up duration; the findings discussed in this study are based on short-term (7 months) assessment. So it is not clear whether the intervention has sustained effects. Previous studies have found reduced effects of school-based smoking prevention interventions over time (Peterson et al., 2000). Additionally some programmes failed to identify short-term effects of the intervention but did observe long-term effects (De Vries et al., 2003).

8.10 Conclusion

Malaysia is a country with a young population as approximately 40% of the total population are aged below 20 years (Department of Statistics Malaysia, 2010). Preventing the uptake of smoking among adolescents in Malaysia is important. According to the Global Youth Tobacco Survey (GYTS) 2000-2006, the prevalence of smoking among Malaysian adolescents aged between 13-15 years is the highest in the South East Asian region (Hammond et al, 2008). It has been estimated that in Malaysia, approximately fifty adolescents aged less than 18 years start smoking every day or one in five adolescents are

smokers (Fong et al., 2005). The findings of this study are therefore, potentially important as they might inform future attempts to reduce smoking among Malaysian adolescents.

To my knowledge, this is the first study that evaluates the effectiveness of a peer educator intervention in preventing the uptake of smoking amongst adolescents mostly aged 13 years in an economically developing country. The short-term results of using the peer educator intervention to prevent smoking among adolescents showed significant and promising effects. The implementation of this intervention is practical and acceptable to students who are selected to be peer educators. Improving the peer educator training by applying the views of the young people who took part may also effect an improvement in the intervention. However, the monitoring of these effects over time is needed and important. Therefore, future research that involves more schools is required that draws on the methods I have described as these investigations would obtain more reliable effect sizes.

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Appendix 2.1(1/2)

Search Databases

MEDLINE(OVID)

1. exp Smoking/ or Smoking.mp.
2. exp Tobacco/ or tobacco.mp.
3. 1 or 2
4. exp Schools/ or schools.mp.
5. students.mp. or exp Students/
6. prevent*.mp.
7. randomized controlled trials.mp. or exp Randomized Controlled Trial/
8. limit 5 to "adolescent (13 to 18 years)"
9. 3 and 4 and 6 and 7 and 8
10. limit 9 to yr="2000 - 2010"

EMBASE

1. exp SMOKING/ or exp ADOLESCENT SMOKING/ or exp CIGARETTE SMOKING/ or Smoking.mp. or exp SMOKING HABIT/
2. tobacco.mp. or exp TOBACCO/
3. 1 or 2
4. schools.mp. or exp school/
5. students.mp. or exp student/
6. limit 5 to adolescent <13 to 17 years>
7. prevent*.mp.
8. 3 and 4 and 6 and 7
9. limit 8 to randomized controlled trial
10. limit 9 to yr="2000 - 2010"

Cochrane Library

1. smoking OR tobacco use OR cigarette
2. students OR adolescen*
3. school based OR schools
4. prevent*

Appendix 2.1(2/2)

PsycINFO

1. smoking OR tobacco use
2. school* OR school-based
3. prevent*
4. Adolescent:13-18

CINAHL

1. smoking OR tobacco use
2. school* OR school-based
3. prevent*
4. Adolescent:13-18

ASSIA (Applied social sciences and abstract)

1. smoking OR tobacco use
2. school* OR school-based
3. prevent*
4. Adolescent:13-18

Google Scholar

Keyword: school-based smoking prevention, adolescents, smoking intervention

Appendix 2.2(1/6)

DATA EXTRACTION SHEET (School-based Smoking Prevention Programmes)

Title :

_____

_____

_____

Researchers: _____

Country of origin: _____

Year: _____

CHECKLIST OF STUDIES

INCLUSION CRITERIA		**RESPONSE**		**NOTE**
		YES	**NO**	
1	**Study design:** Randomized Controlled Trials (RCT)			
2	**Participants:** Adolescents aged 11-17			
3	**Setting:** School-based			
4	**Study duration:** Follow-up at least 6 months after the baseline data collection			
5	**Outcome measure:** Smoking prevalence (Never smoked)			
6	**Meeting all study inclusions**			

CHECKLIST: Randomised Controlled Trials

Study identification:			
Checklist completed by:			
Section 1: Internal validity			
In a well conducted RCT study...		In this study this criterion is:	
1.1	The study addresses an appropriate and clearly focused question.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	An adequate concealment method is used	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	Subjects and investigators are kept ‘blind’ about treatment allocation	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	The treatment and control groups are similar at the start of the trial	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

1.6	The only difference between groups is the treatment under investigation	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?		
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
Section 2: Overall assessment of the study			
2.1	How well was the study done to minimise bias?		
2.2	If coded as +, or - what is the likely direction in which bias might affect the study results?		
2.3	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?		
2.4	Are the results of this study directly		

	applicable to the participant group targeted by this guideline?	
Section 3: Description of the study (the following information is required to complete evidence tables facilitating cross-study comparisons. Please complete all sections for which information is available).		
3.1	Do we know who the study was funded by?	[ ] Academic Institution [ ] Healthcare Industry [ ] Government [ ] NGO [ ] Public funds [ ] Other
3.2	How many centres are participants recruited from?	
3.3	From which countries are participants selected? *(Select all those involved. Note additional countries after "Other")*	[ ] Scotland [ ] UK [ ] USA [ ] Canada [ ] Australia [ ] New Zealand [ ] France [ ] Germany [ ] Italy [ ] Netherlands [ ] Scandinavia [ ] Spain [ ] Other:
3.4	What is the social setting (ie type of environment in which they live) of participants in the study?	[ ] Urban [ ] Rural [ ] Mixed
3.5	What criteria are used to decide who should be INCLUDED in the study?	
3.6	What criteria are used to decide who should be EXCLUDED from the study?	
3.7	What intervention or risk factor is investigated in the study? (Include dosage where appropriate)	
3.8	What comparisons are made in the study? (ie what alternative treatments are used to compare the intervention with?). Include	

	dosage where appropriate.			
3.9	What methods were used to randomise patients, blind patients or investigators, and to conceal the randomisation process from investigators?			
3.10	How long did the active phase of the study last?			
3.11	How long were participants followed-up for, during and after the study?			
3.12	List the key characteristics of the participants population. Note if there are any significant differences between different arms of the trial.			
3.13	Record the basic data for each arm of the study. If there are more than four arms, note data for subsequent arms at the bottom of the page			
	Arm 1: **Treatment:** **Sample size:** **No. analysed** **With outcome:** **Without outcome:**	**Arm 2:** **Treatment:** **Sample size:** **No. analysed** **With outcome:** **Without outcome** **Primary outcome?**	**Arm 3:** **Treatment:** **Sample size:** **No. analysed** **With outcome:** **Without outcome** **Primary outcome?**	**Arm 4:** **Treatment:** **Sample size:** **No. analysed** **With outcome:** **Without outcome** **Primary outcome?**

3.14	Record the basic data for each IMPORTANT outcome in the study. If there are more than four, not data for additional outcomes at the bottom of the page.			
	Outcome 1: **Value:** **Measure:** **P value** **Upper CI** **Lower CI** **Primary outcome?**	**Outcome 2:** **Value:** **Measure:** **P value** **Upper CI** **Lower CI** **Primary outcome?**	**Outcome 3:** **Value:** **Measure:** **P value** **Upper CI** **Lower CI** **Primary outcome?**	**Outcome 4:** **Value:** **Measure:** **P value** **Upper CI** **Lower CI** **Primary outcome?**
3.15	**Notes.** Summarise the authors conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question.			

Appendix 2.3(1-2/2)

CHARACTERISTICS OF EXCLUDED STUDIES

1st Researcher, year	Characteristics				
	RCT	**Adolescents (11-18yrs)**	**Follow-up duration >6 months**	**School-based intervention**	**Outcome measure: preventing the uptake of smoking**
Ringwaltet al,2010 (USA)	Yes	Yes	Yes	Yes	No
Hiemstra et al, 2009 (Netherlands)	Yes	Yes	Yes	No (home-based)	Yes
Perry et al, 2009 (India)	Yes	Yes	Yes	No (multicomponent)	No
Johnson et al, 2009 (USA)	Yes	Yes	Yes	Yes	No(cessation programme-reduce smoking)
Sloboda et al, 2009, (USA)	Yes	Yes	Yes	Yes	No(cessation programme-reduce smoking)
Ringwalt et al, 2009 (USA)	Yes	Yes	Yes	Yes	No
Muller Riemenschnei et al, 2008 (German)	Yes	Yes	Yes	No (multisectoral)	No
Resnicow et al, 2008(South Africa)	Yes	Yes	Yes	Yes	No
Varun, 2008 (UK)	Yes	Yes	Yes	Yes	No
Prokhorov et al, 2008 (USA)	Yes	Yes	Yes	No (computer-based)	Yes
Hamilton et al, 2007 (Australia)	Yes	Yes	Yes	Yes	No (Cessation programme-reduce regular smokers)
Glanz et al, 2007 (USA)	Yes	Yes	Yes	Yes	No (No f/up results)
Stigler et al, 2007 (India)	Yes	Yes	Yes	Yes	No (results on knowledge, belief & perception)
Ekerbicer et al, 2007, Turkey	Yes	Yes	Yes	No	No
Sussman et al, 2007 (USA)	Yes	Yes	Yes	Yes	No
Wen et al, 2007 (China)	Yes	Yes	Yes	Yes	No (articles in Chinese)
Valente et al, 2007 (USA)	Yes	Yes	Yes	Yes	No
Metz et al, 2006 (USA)	Yes	Yes	Yes	Yes	No (results on knowledge, belief & skills)
Seal, 2006	Yes	Yes	Yes	Yes	No (results on

(Thailand)					knowledge, belief & skills)
Valente et al, 2006 (USA)	Yes	Yes	Yes	Yes	No
De Vries et al, 2006 (Europe)	Yes	Yes	Yes	No (Multicomponent approach)	Yes
Simon Morton et al, 2005 (USA)	Yes	Yes	Yes	No	No
Starkey et Al, 2005 (UK)	Yes	Yes	Yes	Yes	No (no results)
Werch et al, 2005 (USA)	Yes	Yes	Yes	Yes	No
Ausems et al, 2004 (Netherland)	Yes	Yes	Yes	Partly (computer-based)	Yes
De Vries et al, 2003 (Europe)	Yes	Yes	Yes	Partly	Yes
Botvin et al, 2003 (USA)	Yes	Yes	No (3 months)	Yes	No
Schofield et al, 2003 (Australia)	Yes	Yes	Yes	Yes	No (cessation programme-reduce regular smokers)
Aveyard et al, 2003 (UK)	Yes	Yes	Yes	Yes	No (identify risk of smoking)
Perry et al, 2003 (USA)	Yes	Yes	Yes	Yes	No (results on drug use & violence)
Elder et al, 2002 (USA)	Yes	Yes	Yes	No (Community based)	No (cessation programme-reduce regular smokers)
Reddy et al, 2002, (India)	Yes	Yes	Yes	No (include family-based)	No
Storr et al, 2002 (USA)	Yes	No	Yes	Yes	Yes
Stephen Brown et al, 2002 (Canada)	Yes	Yes	Yes	Yes	No
Mahoney et al, 2002 (USA)	Yes	Yes	Yes	Yes	No (results on knowledge & attitude)
Aveyard et al, 2001 (UK)	Yes	Yes	Yes	No (computer-based)	No
Mann et al, 2000 (USA)	Yes	No	-	Yes	No (No results)
Peterson et al, 2000 (USA)	Yes	No	Yes	Yes	Yes
Sashegyi et al, 200 o(USA)	Yes	Yes	Yes	Yes	No
Schinke et al, 2000 (USA)	Yes	Yes	Yes	No (Community-based)	Yes

ITT adjusted

Odds ratio meta-analysis

Stratum	Table (xt, xc, nt, nc)				
1	187	140	777	582	Wen
2	596	597	1978	1891	Faggiano
3	197	282	433	479	Vartiainen
4	156	158	471	407	Unger
5	625	538	339	172	Crone

Stratum	Odds ratio	95% CI (CML)		% Weights (fixed, random)		
1	1.000496	0.778487	1.287698	11.584155	18.592382	Wen
2	0.954415	0.836402	1.08909	41.884308	23.99077	Faggiano
3	0.772796	0.613817	0.972343	15.760963	19.574248	Vartiainen
4	0.853181	0.653671	1.113705	11.2092	17.929956	Unger
5	0.589422	0.471404	0.735906	19.561375	19.912644	Crone

Fixed effects (Mantel-Haenszel, Robins-Breslow-Greenland)
Pooled odds ratio = 0.848383 (95% CI = 0.778045 to 0.92508)
Chi² (test odds ratio differs from 1) = 13.686785 P = 0.0002

Fixed effects (conditional maximum likelihood)
Pooled odds ratio = 0.848634
Exact Fisher 95% CI = 0.77755 to 0.92616
Exact Fisher one sided P = 0.0001, two sided P = 0.0002
Exact mid-P 95% CI = 0.778292 to 0.925279
Exact mid-P one sided P < 0.0001, two sided P = 0.0002

Non-combinability of studies
Breslow-Day = 16.491912 (df = 4) P = 0.0024
Cochran Q = 16.438666 (df = 4) P = 0.0025
Moment-based estimate of between studies variance = 0.033871
I² (inconsistency) = 75.7% (95% CI = 11.3% to 88.2%)

Random effects (DerSimonian-Laird)
Pooled odds ratio = 0.822602 (95% CI = 0.681776 to 0.992518)
Chi² (test odds ratio differs from 1) = 4.154897 (df = 1) P = 0.0415

Bias indicators
Begg-Mazumdar: Kendall's tau = 0 P = 0.8167 (low power)
Egger: bias = -2.831879 (95% CI = -13.922243 to 8.258485) P = 0.4759
Horbold-Egger: bias = -2.641068 (92.5% CI = -12.187865 to 6.905728) P = 0.5121

Without Wen et al study.

Odds ratio meta-analysis (ITT adjusted_Without Wen et al study)

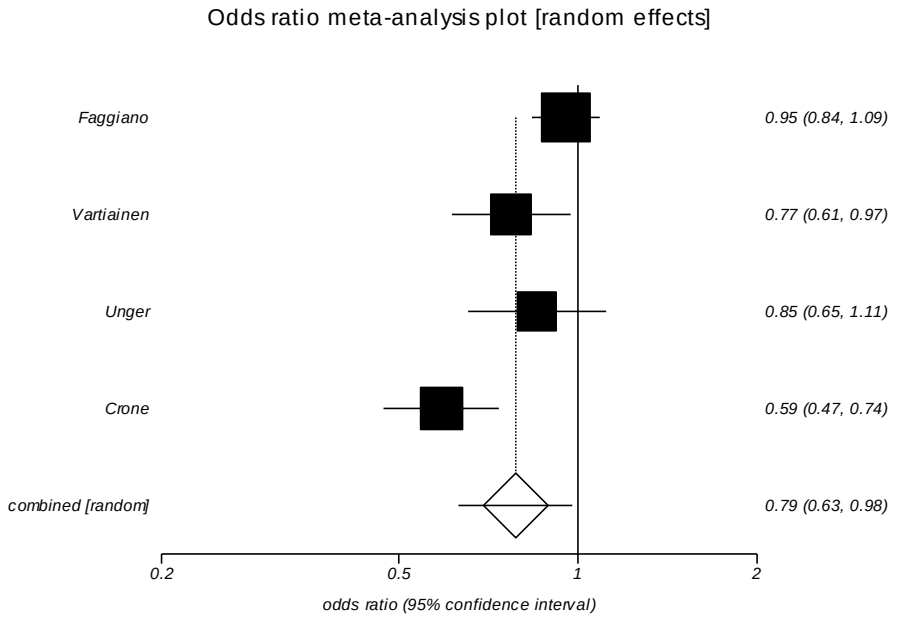
Stratum	Odds ratio	95% CI (CML)		% Weights (fixed, random)		
1	0.954415	0.836402	1.08909	47.371947	28.943908	Faggiano
2	0.772796	0.613817	0.972343	17.825948	24.172338	Vartiainen
3	0.853181	0.653671	1.113705	12.677818	22.337873	Unger
4	0.589422	0.471404	0.735906	22.124287	24.545882	Crone

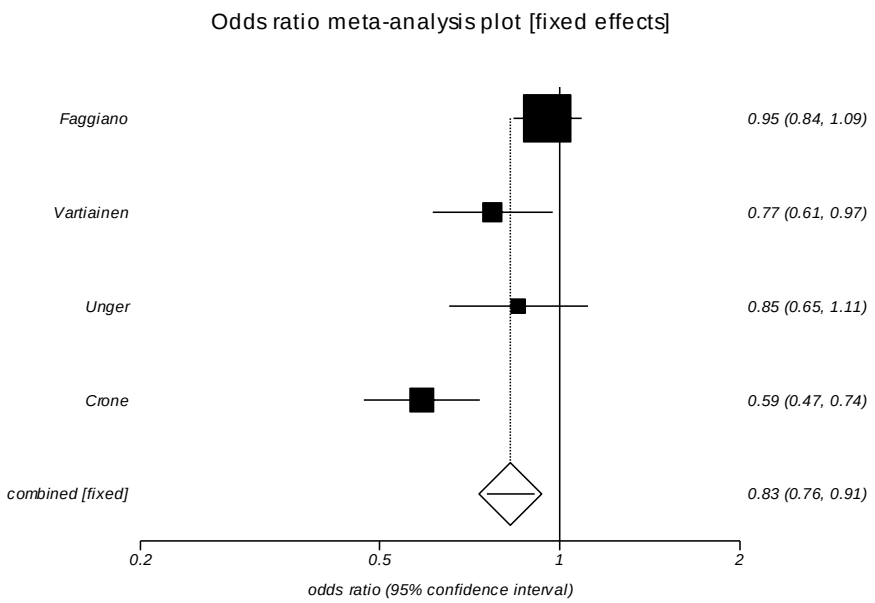
Fixed effects (Mantel-Haenszel, Robins-Breslow-Greenland)
Pooled odds ratio = 0.828453 (95% CI = 0.755144 to 0.908879)
Chi² (test odds ratio differs from 1) = 15.661541 P < 0.0001

Fixed effects (conditional maximum likelihood)
Pooled odds ratio = 0.828622
Exact Fisher 95% CI = 0.754449 to 0.90999
Exact Fisher one sided P < 0.0001, two sided P < 0.0001
Exact mid-P 95% CI = 0.755274 to 0.909
Exact mid-P one sided P < 0.0001, two sided P < 0.0001

Non-combinability of studies
Breslow-Day = 14.510058 (df = 3) P = 0.0023
Cochran Q = 14.46878 (df = 3) P = 0.0023
Moment-based estimate of between studies variance = 0.039342
I² (inconsistency) = 79.3% (95% CI = 10.9% to 90.4%)

Random effects (DerSimonian-Laird)
Pooled odds ratio = 0.78582 (95% CI = 0.630318 to 0.979684)
Chi² (test odds ratio differs from 1) = 4.589891 (df = 1) P = 0.0322





Without Faggiano et al. Study

Odds ratio meta-analysis

Stratum	Table (xt, xc, nt, nc)				
1	187	140	777	582	Wen
2	197	282	433	479	Vartiainen
3	156	158	471	407	Unger
4	625	538	339	172	Crone

Stratum	Odds ratio	95% CI (CML)		% Weights (fixed, random)		
1	1.000496	0.778487	1.287698	19.93292	24.501383	Wen
2	0.772796	0.613817	0.972343	27.119977	25.699931	Vartiainen
3	0.853181	0.653671	1.113705	19.287733	23.687732	Unger
4	0.589422	0.471404	0.735906	33.659369	26.110954	Crone

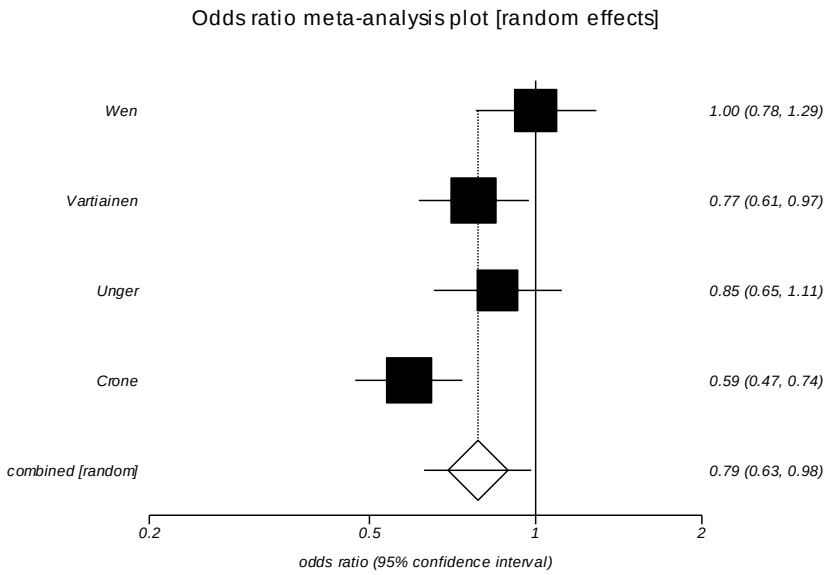
Fixed effects (Mantel-Haenszel, Robins-Breslow-Greenland)
Pooled odds ratio = 0.771965 (95% CI = 0.687204 to 0.867181)
Chi² (test odds ratio differs from 1) = 18.731539 P < 0.0001

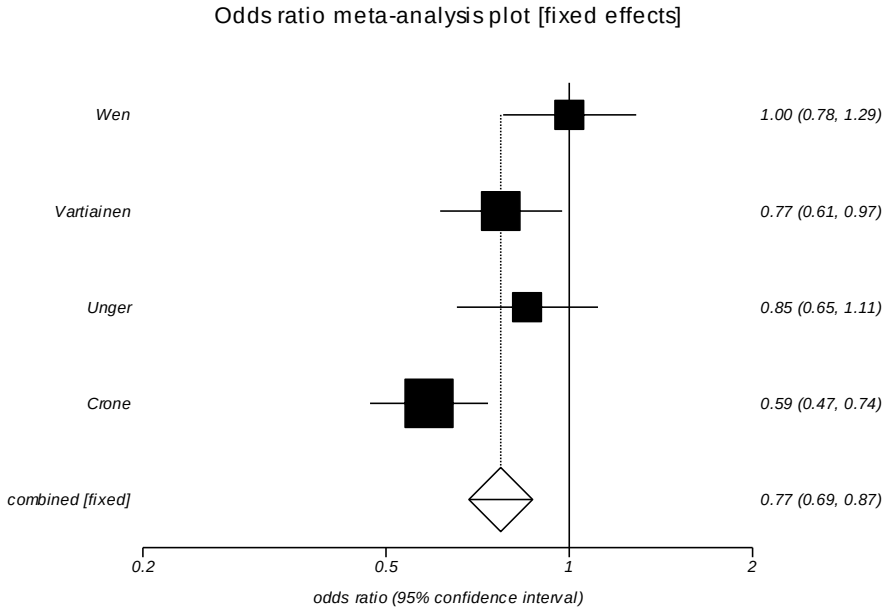
Fixed effects (conditional maximum likelihood)
Pooled odds ratio = 0.772703
Exact Fisher 95% CI = 0.686729 to 0.869278
Exact Fisher one sided P < 0.0001, two sided P < 0.0001
Exact mid-P 95% CI = 0.687904 to 0.867802
Exact mid-P one sided P < 0.0001, two sided P < 0.0001

Non-combinability of studies
Breslow-Day = 10.90087 (df = 3) P = 0.0123
Cochran Q = 10.872709 (df = 3) P = 0.0124
Moment-based estimate of between studies variance = 0.037602
I² (inconsistency) = 72.4% (95% CI = 0% to 88.1%)

Random effects (DerSimonian-Laird)
Pooled odds ratio = 0.785248 (95% CI = 0.627941 to 0.981962)
Chi² (test odds ratio differs from 1) = 4.492496 (df = 1) P = 0.034

Bias indicators
Begg-Mazumdar: Kendall's tau = 0.666667 P = 0.3333 (low power)
Egger: bias = 18.656631 (95% CI = -27.547173 to 64.860435) P = 0.2245
Horbold-Egger: bias = 16.965712 (92.5% CI = -11.753707 to 45.685131) P = 0.179





UNIT PERANCANG EKONOMI
Economic Planning Unit
JABATAN PERDANA MENTERI
Prime Minister's Department
BLOK B5 & B6
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62502 PUTRAJAYA
MALAYSIA

Telefon : 603-8872 3333

Ruj. Tuan: Your Ref.: UPE: 40/200/19/2761

Ruj. Kami: Our Ref.:

Tarikh: Date: 2 March 2011

Elniee Binti Melson
51 Walsall Street
Coventry
CV4 8EZ
United Kingdom
Email: E.B.Melson@warwick.ac.uk

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application, I am pleased to inform you that your application to conduct research in Malaysia has been *approved* by the **Research Promotion and Co-Ordination Committee, Economic Planning Unit, Prime Minister's Department.** The details of the approval are as follows:

Researcher's name	:	**ELNIEE BINTI MELSON**
Passport No. / I. C No:		**731020-12-5062**
Nationality	:	**MALAYSIAN**
Title of Research	:	**"DEVELOPMENT AND EVALUATION OF A SCHOOL-BASED SMOKING PREVENTION INTERVENTION FOR ADOLESCENTS IN MALAYSIA"**
Period of Research Approved:		**9 MONTHS**

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya and bring along two (2) passport size photographs. You are also required to comply with the rules and regulations stipulated from time to time by the agencies with which you have dealings in the conduct of your research.

3. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and

b) Three (3) copies of your final dissertation/publication.

4. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research. Thank you.

Yours sincerely,

(MUNIRAH ABD. MANAN)
For Director General,
Economic Planning Unit.
E-mail: munirah@epu.gov.my
Tel: 88882809
Fax: 88883961

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass**.

Cc:

Ketua Setiausaha
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pelajaran Malaysia
Aras 1-4, Blok E-8
Kompleks Kerajaan Parcel E
Pusat Pentadbiran Kerajaan Persekutuan
62604 Putrajaya.

28th February 2011

Warwick Medical School
University of Warwick
Coventry CV4 7AL
United Kingdom

Director
Sabah Health Department
Tingkat 7 Rumah Persekutuan Kota Kinabalu
Jalan Mat Salleh
Kota Kinabalu
Sabah (att: Senior Principal Assistant Director, Health Promotion Unit)

Dear Sir

REQUESTING FOR A SUPPORT IN CONDUCTING HEALTH PROMOTION ACTIVITIES IN SCHOOLS IN THE STATE OF SABAH, MALAYSIA

1. I am a staff of the Ministry of Health, Malaysia, currently on study leave to further my study at the University of Warwick, United Kingdom under the scholarship of the Ministry of Health since October 2009. I will be conducting a research entitle 'Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia.'

2. This research aims to prevent the smoking initiation and escalation of smoking among adolescents and will be conducted in 8 selected schools in the district of Kota Kinabalu, Penampang, Keningau, Tambunan and Tenom. The participants in this research are all Form 1 students with passive parental consent.

3. Participating schools will be allocated randomly into intervention and control schools. Health promotion activities will be conducted in both intervention and control schools. However in intervention schools, the peer educator programme will be added in which selected students will act as peer educator and undertake a two-day training session.

4. Therefore, I would like to request a support from your department to conduct health promotion activities in schools as part of the usual care such as health talks, exhibition and health education printed materials distribution. In addition, I also would like to invite the health promotion experts to join the facilitator team in conducting the peer educator training. This research project will be monitored and followed up at 6 months duration from baseline data collection.

Thank you for your kind cooperation.

Yours sincerely

(**Elniee Binti Melson**)
PhD student

UNIT PROMOSI KESIHATAN
BAHAGIAN KESIHATAN AWAM
JABATAN KESIHATAN NEGERI SABAH
Tingkat 1, Rumah Persekutuan
Jalan Mat Salleh
88590 Kota Kinabalu,
Sabah

CERTIFIED MS ISO 9001:2000
Registration No: AR 4361

Telefon : 088 - 245105
Fax : 088 – 248107
Laman web : jknsabah.moh.gov.my

4th March 2011

Melson, Elniee
Warwick Medical School
University of Warwick
Coventry CV4 7AL
United Kingdom

Dear Mrs. Melson,

REQUEST FOR SUPPORT IN CONDUCTING HEALTH PROMOTION ACTIVITIES IN SCHOOLS IN THE STATE OF SABAH, MALAYSIA

I am delighted to inform you that the Health Promotion Unit of the Sabah Health Department has considered your request for a support in conducting the health promotion intervention in your research undertaking.

If you have any problems while conducting your research here in the State of Sabah Malaysia, please don't hesitate to get in touch with us. We very much hope your research would bring a new and refreshing insight in the smoking prevention field.

We look forward to hear from you soon on this matter.

Yours sincerely,

(**JUGIN MINING**)
Senior Principal Assistant Director (Health Promotion)
Sabah Health Department
Malaysia

Appendix 3.4

LETTER OF APPLICATION TO CONDUCT RESEARCH TO EDUCATION DEPARTMENT

Warwick Medical School
University of Warwick
Coventry CV4 7AL
United Kingdom

Director
Sabah Education Department
Tingkat 7 Rumah Persekutuan Kota Kinabalu
Jalan Mat Salleh
Kota Kinabalu
Sabah

4th April 2011

Dear Sir

APPLICATION FOR CONDUCTING A RESEARCH IN SCHOOLS IN THE STATE OF SABAH, MALAYSIA

1. I am a member of staff of the Ministry of Health, Malaysia, currently on study leave to undertake further my study at the University of Warwick, United Kingdom under the scholarship of the Ministry of Health since October 2009. I will be conducting a research project entitled 'Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia.'
2. I would like to apply for permission to conduct this research in 8 selected schools in the district of Kota Kinabalu, and Keningau. This research aims to prevent the smoking initiation and escalation of smoking among adolescents. The participants in this research are all Form 1 students with passive parental consent.
3. Participating schools will be allocated randomly into intervention and control schools. We will implement the health promotion activities which are conducted by the Health Promotion Unit from regional health offices, in both intervention and control schools. However in intervention schools, we will add the peer health educator programme in which selected students will act as peer educators and will undertake a two-day training session. This research involves answering self-administered questionnaires, implementation of health promotion activities and peer educators training. In addition this research project will be monitored and followed up at 6 months duration from baseline data collection.
4. For your information this research is approved by the Economic Planning Unit of Prime Minister Department. I will comply with the codes and ethics laid out by the University of Warwick and the Ministry of Education, Malaysia.

Thank you for your kind cooperation.

Yours faithfully

(Elniee Binti Melson)

Appendix 3.5(1/3)

LETTER OF INVITATION TO HEAD TEACHER TO PARTICIPATE IN THE RESEARCH

Sabah Health Department
Level 3, Federal House
Mat Salleh Street
88590 Kota Kinabalu
Sabah

To
The Head teacher
Sekolah Menengah Kebangsaan_____
Sabah 1st May 2011

Dear Sir/Madam
INVITATION TO PARTICIPATE IN RESEARCH FOR DEVELOPMENT AND EVALUATION OF A SCHOOL-BASED SMOKING PREVENTION INTERVENTION FOR ADOLESCENTS IN MALAYSIA

1. I am a member of staff of the Ministry of Health, Malaysia, currently on study leave to undertake further study at the University of Warwick, United Kingdom under the scholarship of the Ministry of Health since October 2009. I am conducting a research project entitled 'Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia'
2. I would like to invite your school to participate in school-based smoking prevention intervention for adolescents. This research aims to prevent the smoking initiation and escalation of smoking among adolescents. The participants in this research are all Form 1 students with passive parental consent.
3. Participating schools will be allocated randomly into intervention and control schools. We will implement the health promotion activities which are conducted by the Health Promotion Unit from regional health offices, in both intervention and control schools. However in intervention schools, we will add the peer health educator programme in which selected students will act as peer educators and will undertake a two-day training session. This research involves answering self-administered questionnaires and will be monitored and followed up at 6 months duration from baseline data collection.
4. I would like you to complete the attached agreement consent form *(Attachment a)* and send it back to me, the researcher at above address if your school is interested and commited to participating in this research project. The details of this study are explained in attached Information Sheet (*Attachment b*). For your information this research is approved by the Economic Planning Unit of Prime Minister Department, Malaysia. I will comply with the codes and ethics laid out by the University of Warwick and the Ministry of Education, Malaysia.

Thank you for your kind cooperation.

Yours faithfully

(Elniee Binti Melson)

Appendix 3.5(2/3)
Attachment a

AGREEMENT CONSENT FORM
(Please return this form to Researcher)

PROJECT TITLE :
DEVELOPMENT AND EVALUATION OF SCHOOL-BASED SMOKING PREVENTION INTERVENTION AMONG ADOLESCENTS IN MALAYSIA

RESEARCHER : ELNIEE BINTI MELSON, University of Warwick

I confirm that I have read and understood the information sheet overleaf for the above research project. On behalf of this school, I do agree to participate in the above study. Thanks

Signed :…… Date:……

Name of head teacher : ……

Name of School:……..

Appendix 3.5(3/3)
Attachment b

THE UNIVERSITY OF WARWICK

Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia

INFORMATION SHEET FOR HEAD TEACHER

My name is Elniee Binti MELSON and I am a postgraduate student from the Warwick Medical School at the University of Warwick, United Kingdom. As part of my degree course, I am undertaking a research project for my Health Sciences dissertation. The title of my project is above.

We are inviting your school to participate in this research project. This information sheet is provided to help you understand and make decision.

What the study is about?

Smoking-related diseases are a major current public health concern related diseases and have become the leading cause of premature mortality with 10,000 deaths reported annually. Approximately 1 out of every 5 deaths in Malaysia. According to Department of Statistics, Malaysia, the three principal causes of medically certified death in Malaysia during 2007 were ischemic heart disease, cerebrovascular disease and Septicaemia. It has been estimated that about 50 adolescents below the age of 18 years start smoking every day in Malaysia and currently one in five adolescents are smokers. School-based smoking prevention programme might have the potential to prevent the smoking initiation and escalation of smoking.
This study is evaluating the effectiveness of a school-based smoking prevention intervention. Effectiveness will focus on the prevention of smoking initiation and a reduction in the escalation of smoking. The findings of this study might potentially result in making a list of recommendations for future adolescent smoking prevention interventions in Malaysia.

What would taking part in this study involved?

If you would like your school to participate in this study, please complete the agreement consent form attached and send it back to the researcher. We will arrange for external health promotion officers to come into your school to administer a confidential questionnaire to all pupils in Form 1. After completing the questionnaires, pupils will be asked to put their questionnaires in envelopes and seal the envelopes. This will ensure that no one in the school will see their answers. Research has shown that pupils are more likely to answer honesty if their answers are confidential.

After that, participating schools will be allocated randomly into intervention and control schools. We will implement the health promotion activities which are conducted by the Health Promotion Unit from regional health offices, in both intervention and control schools. However in intervention schools, we will add the peer health educator programme in which selected Form 1 students will act as peer educator and will undertake a two-day training session. Peer educators will become the role models and advocate activities to prevent the initiation and escalation of smoking among their peers through daily and informal contact. This research involves answering self-administered questionnaires and will be monitored and followed up at 6 months duration from baseline data collection.

What would happen to the information that students provided?

All information that provided by the students in your school would be treated as confidential and would not be shared with anyone outside from the research team. The researchers would ensure the privacy of participants when presenting the findings of this study.
All data will be anonymised. Each student will have a personal identification number so that we can match the answers to each questionnaire. No one outside of the research team will have access to these personal identifiers and no one within the research team will be able to identify student from his/her personal identifier.

Who is organizing the funding of this study?

This research is undertaken as part of PhD research project under the University of Warwick, United Kingdom with the collaboration from the Ministry of Health and the Malaysian Health Promotion Foundation.

Who has reviewed the study?

The study has been reviewed by the Biomedical Ethics Committee and the Economic Planning Unit from the Prime Minister Department of Malaysia. The study is being conducted under the direction of Dr Christopher Bridle and Dr Wolfgang Markham, Warwick Medical School, The University of Warwick, Coventry, CV4 7AL. The study researcher is Elniee Binti MELSON.

Contact details

If you would like any further information about the study, you can contact the study researcher, Elniee Binti MELSON. She is located at the Health Promotion Unit, Sabah Health Department, Sabah Malaysia on 6088-248107; email: elnieekb@yahoo.com.

Appendix 3.6(1/3)

LETTER OF INFORMATION TO PARENTS/CARER OF STUDENT WHO PARTICIPATE IN THE RESEARCH

Sabah Health Department
Level 3, Federal House
Mat Salleh Street
88590 Kota Kinabalu
Sabah

To
Parents/Carer of Form 1 students

5th May 2011

Dear Parents/Carer,

PARENTAL CONSENT FOR STUDENTS TO PARTICIPATE IN RESEARCH FOR DEVELOPMENT AND EVALUATION OF A SCHOOL-BASED SMOKING PREVENTION INTERVENTION FOR ADOLESCENTS IN MALAYSIA

1. My name is Elniee Binti MELSON. I am a member of staff of Ministry of Health, Malaysia, currently on study leave to further study at University of Warwick, United Kingdom under the scholarship of the Ministry of Health since October 2009. I am conducting a research project entitled 'Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia'. Your child's school have been agreed to participate in this research.
2. This research aims to prevent the smoking initiation and escalation of smoking among adolescents. The participants in this research are all Form 1 students with passive parental consent. If you **do not agree** for your child to be involved in this research, please complete the refusal parental consent form (Attachment a) and send it back to the class teacher. The details of this research are explained in attached Information Sheet (Attachment b).
3. For your information this research is approved by the Economic Planning Unit of Prime Minister Department, Malaysia. I will comply with the codes and ethics laid out by the University of Warwick and the Ministry of Education, Malaysia.

Thank you for your support
Yours faithfully,

……..……..
(Elniee Binti Melson)

THE UNIVERSITY OF WARWICK

REFUSAL PARENTAL CONSENT FORM
PROJECT TITLE :

DEVELOPMENT AND EVALUATION OF SCHOOL-BASED SMOKING PREVENTION INTERVENTION AMONG ADOLESCENTS IN MALAYSIA

RESEARCHER : ELNIEE BINTI MELSON, University of Warwick
Please tick in the appropriate box

1. I confirm that I have read and understood the information sheet overleaf for the above research project. ☐

2. I understand the information that will be given by my child will be held and processed for the following purposes:
<u>to be used anonymously for internal publication for a PHD thesis and to submitted for official assessment. This research will be written up for publication in academic journals or presentation at professional conferences.</u> ☐

However, I **do not agree** for my child _____ in class _____ to participate in the above study. Thanks

Signed :…… Date:……
Name of Parent/Carer : _____

Appendix 3.6(3/3)
Attachment b

Development and evaluation of a school-based smoking prevention intervention for adolescents in Malaysia

INFORMATION SHEET FOR PARENTS/CARER

My name is Elniee Binti MELSON and I am a postgraduate student from the Warwick Medical School at the University of Warwick, United Kingdom. As part of my degree course, I am undertaking a research project for my Health Sciences dissertation. The title of my project is above.

We are inviting your child to take part in this research project. This information sheet is provided to help you understand and make decision.

What the study is about?

Smoking-related diseases are a major current public health concern related diseases and have become the leading cause of premature mortality with 10,000 deaths reported annually. Approximately 1 out of every 5 deaths in Malaysia. According to Department of Statistics, Malaysia, the three principal causes of medically certified death in Malaysia during 2007 were ischemic heart disease, cerebrovascular disease and Septicaemia. It has been estimated that about 50 adolescents below the age of 18 years start smoking every day in Malaysia and currently one in five adolescents are smokers. School-based smoking prevention programme might have the potential to prevent the smoking initiation and escalation of smoking.
This study is evaluating the effectiveness of a school-based smoking prevention intervention. Effectiveness will focus on the prevention of smoking initiation and a reduction in the escalation of smoking. The findings of this study might potentially result in the development of recommendations for future adolescent smoking prevention interventions in Malaysia

How your child would be involved?

All the Form 1 students in your child's school will be asked to answer two questionaires about their attitudes towards smoking. We will carry out the baseline data collection after two weeks of distributing the letter of information to the parents/carer of child. This research involves answering self-administered questionnaires and will be followed up at 6 months duration from baseline data collection.
It is up to you to decide whether you want your child to participate in answering the questionnaire or not. If you **do not agree** for your child to participate, we need you to sign a refusal parental consent form and send it back to the school teacher. Your child's participation is voluntary and he/she is free to withdraw from participating in the above research project.

What would happen to the information my child provided?

All information that provided by your child would be treated as confidential and would not be shared with anyone outside from the research team. The researchers would ensure the privacy of participants when presenting the findings of this study. No one who works in your child's school including the head teachers will see the answers that your child gives.
All data will be anonymised. Each participating child will be given a unique identification number. No one will be able to identify your child. However we need to create this unique identification number so that we can compare answers to the second questionnaire with answers to the first questionnaire. The result may be published in a journal or presented at a conference.

Contact details

If you would like any further information about the study, you can contact the study researcher, Elniee Binti MELSON. She will be located at Health Promotion Unit, Sabah Health Department, Sabah Malaysia on 6088-248107; email: elnieekb@yahoo.com.

Appendix 3.7

FORM NO. :_____

THE UNIVERSITY OF WARWICK

BASELINE QUESTIONNAIRE

Development and evaluation of school-based smoking prevention intervention among adolescents in Malaysia

To all students,

Hello!

Firstly, The Sabah Health Department, Ministry of Health with the collaboration from researcher of The University of Warwick, United Kingdom would like to thank for your participation in this questionnaire.

We will ask you questions about your background, your opinions and experiences of smoking. It is important to us that you are honest when answering. Please read all the questions carefully and take your time answering.

Your participation in this questionnaire is a voluntary and there is NO right or wrong answers. Your answers may differ from your friends and this is okay because all young

YOUR ANSWERS ARE TOTALLY CONFIDENTIAL

Your teachers and parents are not allowed to see any of your answers. Please seal your answered questionnaires in the envelope provided when you finish

ABOUT YOU AND FAMILY

1. What is your date of birth? Day_____ Month_____ Year_____

2. What are the first three letters of your mother first name? | | | |

3. Are you a boy or a girl? [ ] Boy [ ]Girl

4. To which of these ethnic groups do you belong?
[ ] Malay
[ ] Kadazandusun
[ ] Bajau
[ ] Murut
[ ] Chinese
[ ] Other (Please say what):_____

5. Where do you stay during school day?
[ ] With parents
[ ] With relative
[ ] With brother/sister
[ ] School hostel
[ ] Other (Please say what):_____

6. Please say the level of education of your parents/guardian…..

Father/guardian……	Mother ……
[ ] Never attended school	[ ] Never attended school
[ ] Primary school	[ ] Primary school
[ ] Secondary school (Form 1-3)	[ ] Secondary school (Form 1-3)
[ ] Secondary school (Form 4-6)	[ ] Secondary school (Form 4-6)
[ ] University/college	[ ] University/college

7. Does anyone smoking in your family?
   i) Father : [ ] Yes [ ] No
   ii) Mother : [ ] Yes [ ] No
   iii) Brothers/sisters : [ ]Yes [ ] No

8. How many of your close relatives smoke?
[ ] None of them
[ ] Some of them
[ ] Most of them
[ ] All of them
[ ] Not sure

9. How many of your friends smoke?
[ ] None of them
[ ] Some of them
[ ] Most of them
[ ] All of them
[ ] Not sure

YOUR EXPERIENCE WITH TOBACCO

10. Please read all of the following statements very carefully and put an X in the box next to one statement that describes you best....

[ ] I have never smoked not even a puff
[ ] I have only ever tried smoking once
[ ] I used to smoke but I don't smoke anymore
[ ] I smoke occasionally but not as many as 1 cigarette a month
[ ] I smoke at least 1 cigarette every month but not as many as 1 cigarette every week
[ ] I smoke at least 1 cigarette every week
[ ] I smoke at least 1 cigarette every day

11. Have you smoke during the past 7 days?

[ ] Yes [ ] No

12. Have you smoke during the past 30 days?

[ ] Yes [ ] No

13. During the past 30 days (1 month), what form of tobacco products did you consumed other than cigarettes?

[ ] I did not consume any tobacco products during the past 30 days
[ ] I only smoked cigarettes
[ ] Cigars
[ ] Chewing tobacco
[ ] tobacco leaf (birri)
[ ] Other

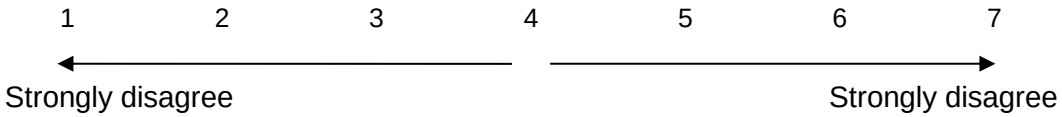
14. During the past 30 days (1 month), how many cigarettes would you say you smoke

[ ] I have not smoked any cigarettes during the past month
[ ] I – 4 cigarettes
[ ] 5 – _ 10 cigarettes
[ ] 10– 20 cigarettes
[ ] More than 20 cigarettes

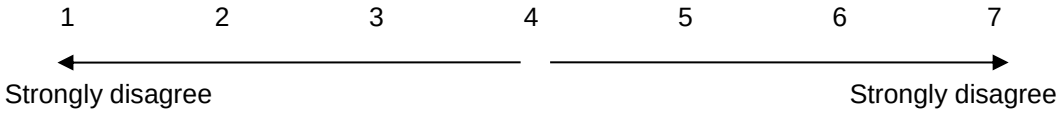
ATTITUDES

Please circle the following scale to represent your opinion:

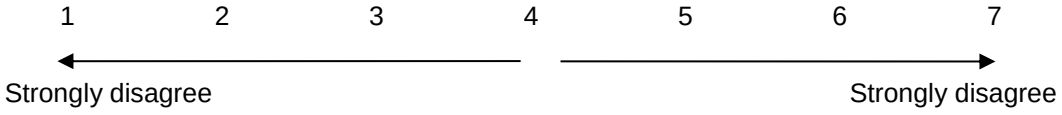
15. I expect to be a non-smoker



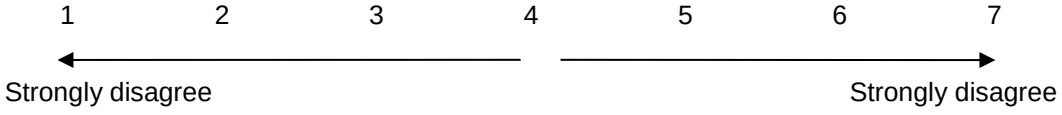
16. I want to be a non-smoker



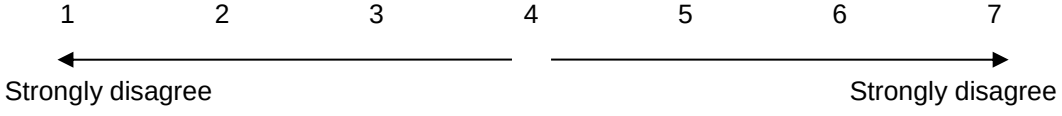
17. I intend to be a non-smoker



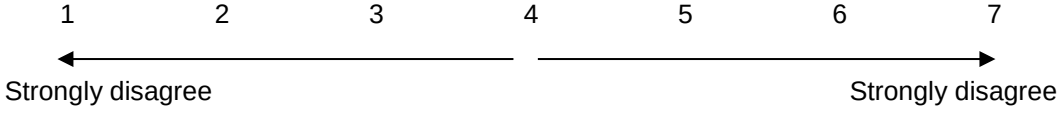
18. If I were to be a smoker, this would be a good thing to do



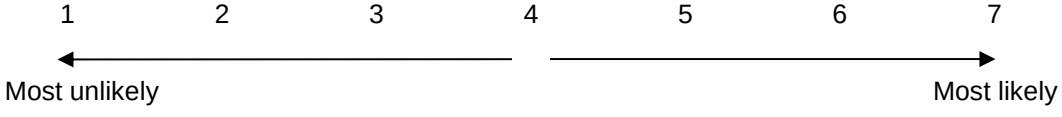
19. If I were to be a smoker, this would be an unpleasant thing to do



20. If I were to be a smoker, this would be a useful things to do



21. If I were to smoke, I would feel that I am doing something positive for me



22. If I were to smoke I would worry about it

1 2 3 4 5 6 7

Most unlikely Most likely

23. If I were to smoke I would feel that this would harm my health

1 2 3 4 5 6 7

Most unlikely Most likely

24. Feeling positive about smoking is extremely desirable

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

25. Feeling worried about smoking is extremely desirable

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

26. Thinking that smoking is harmful to your health is extremely desirable

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

27. Most people who are important to me think that I should be a non-smoker

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

28. It is expected of me that I will smoke in the future

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

29. I feel under pressure to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

30. Friends think I should be a smoker

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

31. My classmates would disapprove if I started smoking

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

32. Most other people my age smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

33. What my friends think as to whether or not I smoke is important to me

1 2 3 4 5 6 7

Strongly disagree(Not at all) (Very much)Strongly disagree

34. What my classmates think I should do in relation to smoking matters to me

1 2 3 4 5 6 7

Strongly disagree (Not at all) (Very much)Strongly disagree

35. Doing what other people my age do regarding smoking is important to me

1 2 3 4 5 6 7

Strongly disagree(Not at all) (Very much)Strongly disagree

36. I am confident that I could be non-smoker if I wanted to be a non smoker

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

37. For me to be a non-smoker would be easy

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

38. The decision to smoke or not is beyond my control

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

39. Whether I smoke or not is entirely up to me

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

40. If someone offered me a cigarette, I would be tempted to smoke

1 2 3 4 5 6 7

Most unlikely Most likely

41. People my age who start smoking because their friends smoke

1 2 3 4 5 6 7

Most unlikely Most likely

42. People my age who start to smoke are pressured to smoke

1 2 3 4 5 6 7

Most unlikely Most likely

43. If I were offered a cigarette I would be more likely to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

44. If my friends started smoking I would find it much more difficult not to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

45. If I felt pressured to smoke I would find it much more difficult not to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

WHAT YOU WERE TAUGHT ABOUT SMOKING IN SCHOOL

46. During this school year, were you taught in any of your classes about the dangers of smoking?
[ ] Yes
[ ] No

49. During this school year, did you discuss in any of your classes the reasons why people your age smoke?
[ ] Yes
[ ] No

50. During this school year, were you taught in any of your classes about the effects of smoking like it makes you teeth yellow, causes wrinkles or makes you smell bad?
[ ] Yes
[ ] No

51. How long ago did you last discuss smoking and health as part of a lesson?
[ ] Never
[ ] This term
[ ] Last term
[ ] more than 1 year ago

52. Have you ever attended anti-smoking programme organised by health staff?
[ ] Yes
[ ] No

53. Have you ever attended health talks on danger of smoking by health staff?
[ ] Yes
[ ] No

54. Have you ever saw posters on danger of smoking?
[ ] Yes
[ ] No

55. Have you ever read pamphlets about danger of smoking?
[ ] Yes
[ ] No

-THANK YOU-

Appendix 3.8

SERIES NO. :_____

FOLLOW-UP QUESTIONNAIRE

Development and evaluation of school-based smoking prevention intervention among adolescents in Malaysia

To all students,

Hello!

Firstly, The Sabah Health Department, Ministry of Health with the collaboration from researcher of The University of Warwick, United Kingdom would like to thank for your participation in this questionnaire.

We will ask you questions about your background, your opinions and experiences of smoking. It is important to us that you are honest when answering. Please read all the questions carefully and take your time answering.

Your participation in this questionnaire is a voluntary and there is NO right or wrong answers. Your answers may differ from your friends and this is okay because all young

YOUR ANSWERS ARE TOTALLY CONFIDENTIAL

Your teachers and parents are not allowed to see any of your answers. Please seal your answered questionnaires in the envelope provided when you finish

ABOUT YOU

Please tick [√] only one answer in the blank box or write your answer in provided space.

1. What is your date of birth? Day_____ Month_____ Year_____

2. What are the first three letters of your mother first name? | | | |

3. Are you a boy or a girl? [ ] Boy [ ]Girl

4. To which of these ethnic groups do you belong?
[ ] Malay
[ ] Kadazandusun
[ ] Bajau
[ ] Murut
[ ] Chinese
[ ] India
[ ] Other (Please say what):_____

5. Where do you stay during school day?
[ ] With parents
[ ] With relative
[ ] With brother/sister
[ ] School hostel
[ ] Other (Please say what):_____

YOUR EXPERIENCE WITH SMOKING

Please tick [√] only one answer in the blank box

6. Please read all of the following statements very carefully and put an X in the box next to one statement that describes you best....
[ ] I have never smoked not even a puff
[ ] I have only ever tried smoking once
[ ] I used to smoke but I don't smoke anymore
[ ] I smoke occasionally but not as many as 1 cigarette a month
[ ] I smoke at least 1 cigarette every month but not as many as 1 cigarette every week
[ ] I smoke at least 1 cigarette every week
[ ] I smoke at least 1 cigarette every day

7. Have you smoke during the past 7 days?
[ ] Yes [ ] No

8. Have you smoke during the past 30 days?
[ ] Yes [ ] No

9. During the past 30 days (1 month), what form of tobacco products did you consumed other than cigarettes?

[ ] I did not consume any tobacco products during the past 30 days
[ ] I only smoked cigarettes
[ ] Cigars
[ ] Chewing tobacco
[ ] tobacco leaf (birri)
[ ] Other

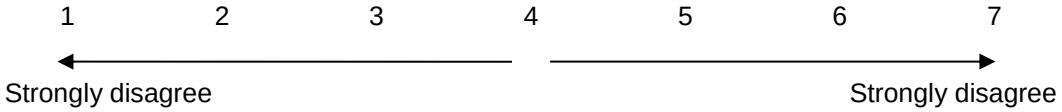
10. During the past 30 days (1 month), how many cigarettes would you say you smoke

[ ] I have not smoked any cigarettes during the past month
[ ] I – 4 cigarettes
[ ] 5 – _ 10 cigarettes
[ ] 10– 20 cigarettes
[ ] More than 20 cigarettes

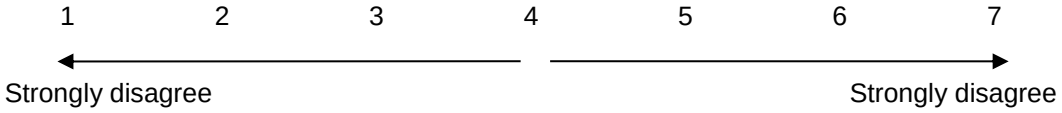
ATTITUDES

Please circle the following scale to represent your opinion:

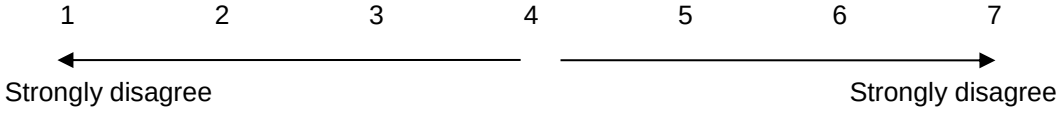
11. I expect to be a non-smoker



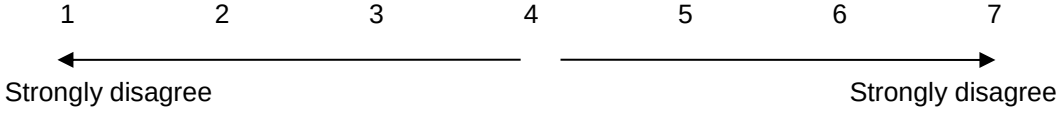
12. I want to be a non-smoker



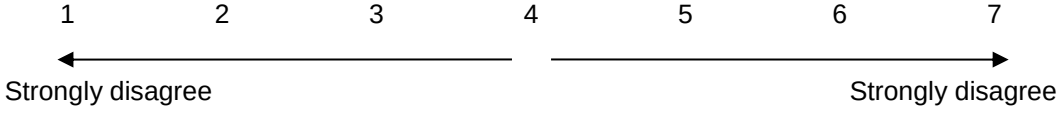
13. I intend to be a non-smoker



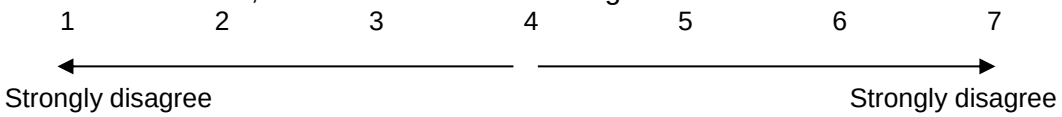
14. If I were to be a smoker, this would be a good thing to do



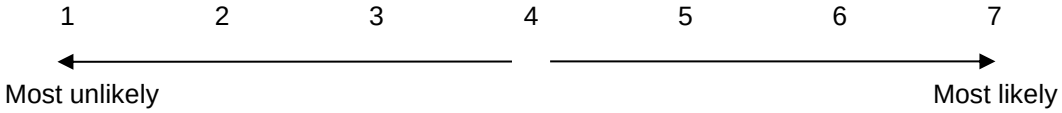
15. If I were to be a smoker, this would be an unpleasant thing to do



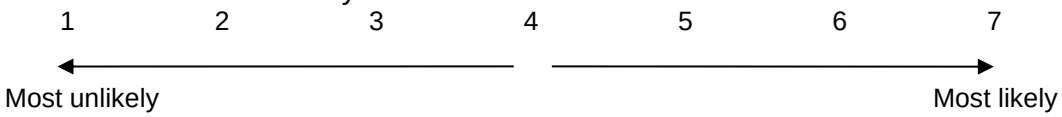
16. If I were to be a smoker, this would be a useful things to do



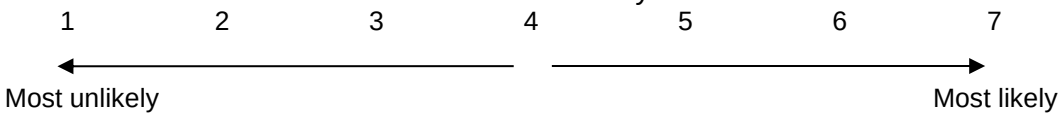
17. If I were to smoke, I would feel that I am doing something positive for me



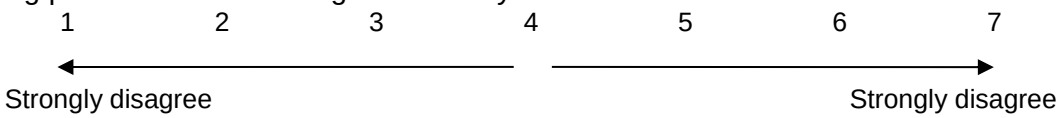
18. If I were to smoke I would worry about it



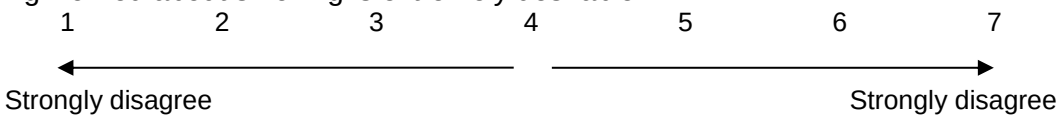
19. If I were to smoke I would feel that this would harm my health



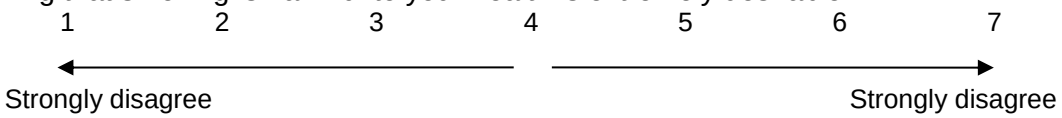
20. Feeling positive about smoking is extremely desirable



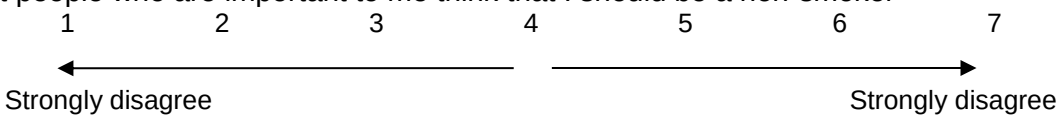
21. Feeling worried about smoking is extremely desirable



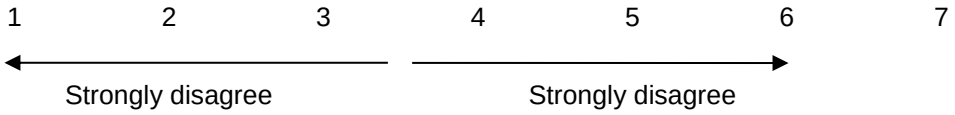
22. Thinking that smoking is harmful to your health is extremely desirable



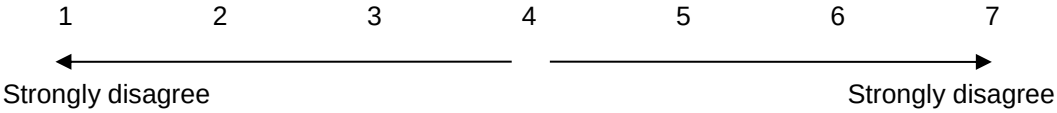
23. Most people who are important to me think that I should be a non-smoker



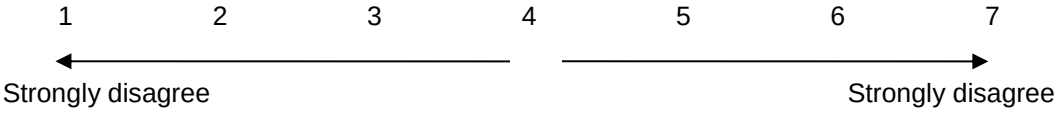
24. It is expected of me that I will smoke in the future



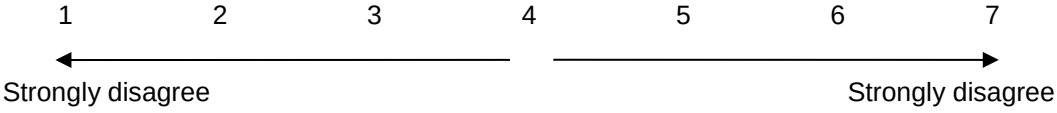
25. I feel under pressure to smoke



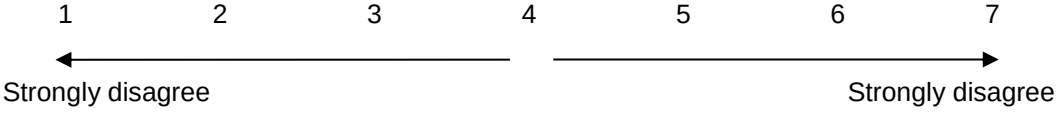
26. Friends think I should be a smoker



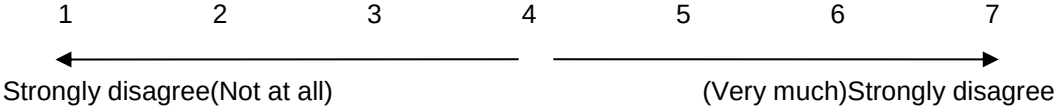
27. My classmates would disapprove if I started smoking



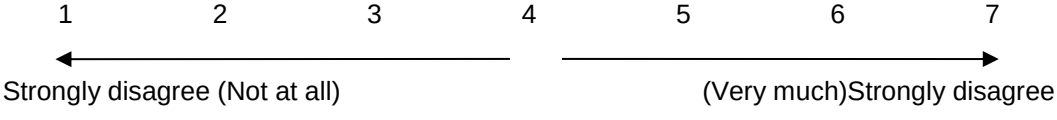
28. Most other people my age smoke



29. What my friends think as to whether or not I smoke is important to me



30. What my classmates think I should do in relation to smoking matters to me



31. Doing what other people my age do regarding smoking is important to me

1 2 3 4 5 6 7

Strongly disagree(Not at all) (Very much)Strongly disagree

32. I am confident that I could be non-smoker if I wanted to be a non smoker

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

33. For me to be a non-smoker would be easy

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

34. The decision to smoke or not is beyond my control

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

35. Whether I smoke or not is entirely up to me

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

36. If someone offered me a cigarette, I would be tempted to smoke

1 2 3 4 5 6 7

Most unlikely Most likely

37. People my age who start smoking because their friends smoke

1 2 3 4 5 6 7

Most unlikely Most likely

38. People my age who start to smoke are pressured to smoke

1 2 3 4 5 6 7

Most unlikely Most likely

39. If I were offered a cigarette I would be more likely to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

40. If my friends started smoking I would find it much more difficult not to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

41. If I felt pressured to smoke I would find it much more difficult not to smoke

1 2 3 4 5 6 7

Strongly disagree Strongly disagree

INTERACTION WITH FRIENDS

42. Have you ever talk to your same age friends about smoking issues?
[ ] Yes
[ ] No

43. Have you ever discuss with your same age friends about the disadvantages of smoking?
[ ] Yes
[ ] No

-THANK YOU-

Appendix 3.9

FORM NO. :_____

THE UNIVERSITY OF WARWICK

NEEDS ASSESSMENT

First 3 letter of your mother's name: ☐☐☐

SEX: ☐ Male ☐ Female

TRAINING LOCATION & DATE
:_____

1. What are the following items you think needed by the peer educator to carry out their role?

(Answer can be more than one)

[ ] Training
[ ] Motivation
[ ] Supervision
[ ] Skill
[ ] Knowledge
[ ] Guidance from teacher
[ ] Recognition
[ ] Reward
[ ] Others (Please say:_____)

2. What are the following features you think you have the advantage?

[ ] Self confidence
[ ] Willing to help
[ ] Able to work in team
[ ] Good communicator
[ ] Brave
[ ] Good listener
[ ]Patient
[ ]Able to mix with friends from all walk of life
[ ] Others (Please say:_____)

3. Please suggest activities that usually adolescents in your school like to involve in?

i)_____
ii)_____
iii)_____
iv)_____
v)_____

-THANK YOU-

Appendix 3.10

FORM NO. :_____

THE UNIVERSITY OF WARWICK

PRE AND POST TRAINING QUESTIONNAIRE

Thank you for participating in the Peer Educator Training. We would like to ask you some questions about your knowledge and opinions. It only will take few minute to answer these questions. Choose only **one answer**. There are no right and wrong answers, as we are interested only in knowing your opinions. We will ask you to complete this questionnaire at the start and end of the training.

First 3 letter of your mother's name: ☐☐☐

SEX: ☐ Male ☐ Female

TRAINING LOCATION & DATE
:_____

A) KNOWLEDGE ABOUT CIGARETTE SMOKING

For each of the 12 statements listed , select the best answer (True, False, Don't know) to represent your knowledge about cigarette smoking

		True	False	Don't know
1.	10,000 people are killed by cigarette smoking in Malaysia each year.	☐	☐	☐
2.	Cigarette smoking kills more people than AIDS	☐	☐	☐
3.	Cigarette contains more than 4,000 harmful substances.	☐	☐	☐
4	The nicotine in cigarettes is not addictive to human	☐	☐	☐
5.	Smokers are more likely to get lung cancer than non-smoker	☐	☐	☐
6.	Smoking can relieve stress and lower blood pressure	☐	☐	☐
7.	Smoking can make you feel fatigue easily	☐	☐	☐
8.	Smoking increases the air exchange capacity of the lungs	☐	☐	☐
9.	The health of a second-hand smokers is not affected	☐	☐	☐
10	Smoking is one of the most common forms of recreational drug use	☐	☐	☐

11	Smoking-related diseases are the main killer in the developing world	☐	☐	☐
12.	According to Malaysian Tobacco Act, buying cigarettes are prohibited to those adolescents aged below 18 years.	☐	☐	☐

B) ATTITUDE TOWARD SMOKING INITIATION

For each of the 12 statements listed , select the best answer (Strongly agree, agree, disagree, strongly disagree) to represent your attitude toward cigarette smoking.

	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
13. Smoking signifies that one is a grown-up	☐	☐	☐	☐
14. Smoking relaxes (tension) and reduces stress	☐	☐	☐	☐
15. It is fun to smoke	☐	☐	☐	☐
16. Smoking is a disgusting behavior	☐	☐	☐	☐
17. Smoking is hazardous to the health of others	☐	☐	☐	☐
18. Smoking helps thinking	☐	☐	☐	☐
19. Accepting a friend's offer of a cigarette will cause you to be more accepted by the friend	☐	☐	☐	☐
20. Smoker has many friends	☐	☐	☐	☐
21. For the good of public health, smoking should be strictly prohibited in public areas	☐	☐	☐	☐
22. Smoking is a personal freedom and others have no right to interfere	☐	☐	☐	☐
23. I do not mind if my future partner is a smoker	☐	☐	☐	☐
24. I prefer being with friends who do not smoke	☐	☐	☐	☐

-THANK YOU-

THE UNIVERSITY OF WARWICK

ASSESSMENT FOR TRAINING MODULE AND PROGRAMME

A) Module

Please select the appropriate number to indicate your opinion of each session.

1– Needs lot of improvement
2– Needs some improvement
3– Satisfactory
4– Good
5– Excellent

No	SESSION	Relevant	Explanation	Intonation	Movement	Gestures
1	Session 1: **Ice breaker** *Suggestion:*_____	☐	☐	☐	☐	☐
2	Session 2: **Peer educator** *Suggestion:*_____	☐	☐	☐	☐	☐
3	Session 3 **Communication** *Suggestion:*_____	☐	☐	☐	☐	☐
4	Session 4: **Smart without tobacco** *Suggestion:*_____	☐	☐	☐	☐	☐
5	Session 5: **Upholding healthy living** *Suggestion:*_____	☐	☐	☐	☐	☐
6	Session 6: **Issue related to smoking** *Suggestion:*_____	☐	☐	☐	☐	☐
7	Session 7: **Planning and leadership** *Suggestion:*_____	☐	☐	☐	☐	☐

B) Training programme

For each of the following statements, indicate your agreement and disagreement on a scale as follow.

No	STATEMENT	Strongly disagree	Disagree	Agree	Strongly agree
8.	I have learned a lot from this training	☐	☐	☐	☐
9.	I found the training interesting	☐	☐	☐	☐
10.	I did not find the training difficult	☐	☐	☐	☐
11.	The practical activities in this training is not too heavy	☐	☐	☐	☐
12.	The group work seems to be fair	☐	☐	☐	☐
13.	The facilitators prepared th sessions carefully	☐	☐	☐	☐
14.	I was able to understand the objective of the training	☐	☐	☐	☐
15.	This training is useful and relevant	☐	☐	☐	☐
16.	I learned new skills relating to handle peer pressure	☐	☐	☐	☐
17.	I was able to apply what I have learn from this training into my new role.	☐	☐	☐	☐

18. Please make a note of at least ONE thing you like about the training

_____

_____

19. Please make a note of at least ONE thing you like to suggest about the training

_____

_____

C) Management of training

Please select the appropriate rating to indicate your opinion of each session.

No	Item	Poor	Fair	Good	Very good	Excellent
20.	Accomodation	☐	☐	☐	☐	☐
21.	Venue	☐	☐	☐	☐	☐
22.	Duration	☐	☐	☐	☐	☐
23.	Food	☐	☐	☐	☐	☐
24.	Teamwork	☐	☐	☐	☐	☐
25.	Facilitation	☐	☐	☐	☐	☐
26.	Safety	☐	☐	☐	☐	☐
27	Overall how do rate the quality of the training	☐	☐	☐	☐	☐

28. Do you have any suggestions for future training?

a)_____

b)_____

c)_____

d)_____

e)_____

-Thank You-

Appendix 3.12

FOCUS GROUP DISCUSSION 1 (After the peer educator training)

Date and Location :_____

FGD Team :_____

1. Purpose of the FGD (3 minutes)
2. Introduction of participants and facilitators (7 minutes)
3. Discussion themes

a) Reasons to be a peer educator (10 minutes)

i) What was your first reaction when your friends nominated you to be peer educator?

(prompt)Were you pleased/shocked/scared/angry/doubt?

(probe)Why do you agree to become a peer educator?

(probe) Do you still feel that way now?

b) Contents of the peer educator training (15 minutes)

ii) How do you think this training will help you in your roles as a peer educator?

(prompt)Do you gain new knowledge/skills/change of mind?

(probe)What are the differences you gain before and after the training?

iii) Which session of the peer educator training did you enjoy the most? And why was that?

iv) What do think about the idea of becoming a better and well informed peer educator?

(prompt) What do you think of the peer educator training course?

c) Expectations/suggestions of the peer educator training (10 minutes)

v) When you first were told to attend the peer educator training, what do you expect from this training course?

(prompt) Why do you want to attend the peer educator training course?

vi) What do you think of the training course need to be improved/added?

(prompt)How/what to improve the activities/understanding/practical?

d) Roles to be played after the peer educator training (10 minutes)

vii) What are the activities you think you will perform or contribute to in your role as a peer educator?

viii) What do you think your response will be if someone was to ridicule your role as a peer educator

4. Summary of discussion points & closing remarks (5 minutes)

Appendix 3.13

FOCUS GROUP DISCUSSION 2 (After 3 months from the peer educator training)

Date and Location :_____

FGD Team :_____

1. Purpose of the FGD (3 minutes)
2. Introduction of participants and facilitators (7 minutes)
3. Discussion themes

a) Carry out the roles as a peer educator (15 minutes)

i) After approximately 3 months since the last you had attended the peer educator training, how do you describe your experiences as a peer educator?

ii) How do you approach your friends and peers in order to influence them from smoking initiation?

iii) How do you describe the implementation of programmes that prevent adolescents from starting to smoke?

b) Peer educator activities (15 minutes)

iv) What are the activities you have been involved?

v) What are the views of your friends about the peer educator programmes?

c) Lessons learn from the peer educator activities (15 minutes)

vi) What do you learn from your role as a peer educator?

vii) Why do you think the peer educator programmes are important to young people?

viii) How easy is it to say 'no' to the offer of cigarette from your best friends or good friends?

4. Summary of discussion points & closing remarks (5 minutes)

Appendix 5.1(1/2)

PARENT/GUARDIAN CONSENT FORM FOR STUDENT TO PARTICIPATE IN THE PEER EDUCATOR PROGRAMME AND PERMISSION TO ATTEND THE PEER EDUCATOR TRAINING.

Dear Parent or legal guardian,

Your child has been selected to be a peer educator in the smoking preventing programme in his/her school. Therefore, your child is required to go through a peer educator training.

The date and venue for the peer educator training is stated as below:-

Date: _____

Venue: _____

For your information, the peer educator training is jointly organised by the Sabah Health Department and the Sabah Education Department. The participation of your child in the peer educator training is a voluntary. The selection of the training venue has fulfilled the guidelines laid out by the Ministry of Education.

The details of the training programme are explained in attached training schedule (Attachment a)

If you agree for your child to be a peer educator in the smoking prevention programme and allow him/her to attend the peer educator training, please complete, sign and return the bottom half of this form to the class teacher.

……

Statement of Consent

I, _____(parent/guardian) hereby consent

my child_____ to participate in the Peer Educator Programme and

allow him/her to attend the Peer Educator Training.

I authorize the organizer to obtain necessary treatment for my child in case of illness, injury or accident. My child has the following medical conditions or allergies about which a health care should be told:_____.

Parent's / guardian's signature :_____

Date :_____

Phone :_____

Schedule for The Peer Educator Training

Day 1

2.00pm	: Registration
3.00pm	: Training introduction/breifing
3.30pm	: Pre-assessment
4.30pm	: break/preparation
6.00pm	: Dinner
7.30pm	: Ice breaker
10.00pm	: Sleep

Day 2

5.45am	: Exercise
7.00am	: Breakfast
8.00am	: Peer Educator
10.30am	: Break
11.00am	: Communication
1.00pm	: Lunch
2.00pm	: Smart without tobacco
4.30pm	: Outdoor activities (game)
6.00pm	: Dinner
8.00 pm	: Upholding healthy living
10.00pm	: Sleep

Day 3

5.45am	: Exercise
7.00am	: Breakfast
8.00am	: Issues related to smoking
10.30am	: Break
11.00am	: Planning and leadership
1.00pm	: Lunch
2.00pm	: Focus Group Discussion/Game
3.00pm	: Post assessment
4.00pm	: Training closure

Appendix 5.2(1/2)

Theoretical frameworks underpinning the Peer Educators Approach developed by YPEER (UN Interagency Group on Young Peoples Health Development and Protection in Europe and Central Asia)

i) The social learning theory(Bandura, 1986)

In social learning theory, people learn indirectly by observing and modeling on others with whom the person identifies. People gain increased self-efficacy through skills training that leads to enhance confidence in being able to carry out behavior and overcome any barriers to perform the behaviour. In the context of peer educator approaches, the inclusion of interactive experimental learning activities are crucially important and peer educators can be important role models. Peer educators are trained and have increased knowledge and skills and they are expected to be role models for their same age peers by staying and advocating never smoker behaviour.

ii) The diffusion of innovation theory(Rogers, 1983)

The diffusion of innovation theory posits the importance of social role in influencing behavior change. The role of opinion leaders in a community, who act as agents for behavior change, is a key element in disseminating information and influencing group norms and customs. In relation to its application to peer educator approaches, the selected peer educators should be trustworthy and credible opinion leaders within the target group. Their roles are especially important to reach their friends through informal and everyday social contacts in school. This theory is particularly important during the anti-smoking campaign and one to one personal and informal talks in school. Trained peer educators are credible sources of information about smoking and understand better the needs and situation faced by their same age peers. Peer educators are encouraged to have person to person exchanges and discussions about smoking hazards and benefits of being never smokers. The more students share similar views and attitudes with the peer educators toward avoiding smoking habit, this will help to create group norms of being smoking free.

iii) The theory of planned behavior (Fishbein and Ajzen, 1975)

The theory of planned behaviour states that the intention of a person to adopt a recommended behavior is determined by an individual's perception of social norms or beliefs about the actions or thoughts of people who are important to the individual, on a particular behavior. This theory is relevant to peer educator approaches because it considers young people's attitudes are highly influenced by their perception of what their peers do and think. They may be highly motivated by the expectations of respected peers. Students are more motivated to remain never smokers or stop smoking if peer educators disapprove of the smoking behavior and are supported by group norms in their classroom to be non smoking.

iv) The theory of participatory education (Freire, 1970)

The theory of participatory education asserts that empowerment and a full participation of the people affected by a given problem is a key to behavior change. The relevance of this theory to peer educator approaches is obvious in which the process of trained peer educators talking to their same age peers about smoking and the informal conformity among themselves to abstain from smoking will facilitate increased impact to the potential success of peer educator intervention.

Appendix 5.3

TIPS TO OVERCOME PEER PRESSURES

We often hear the phrase 'JUST SAY NO'. It sounds easy, but to 'SAY NO' or 'DON'T WANT' to invitation or pressures from peers is actually difficult. Often when declining an invitation, the person who say 'NO' is put in a situation as if he or she is a coward or in the wrong for saying 'NO'. When the pressure gets too high, we may begin to feel unsure of what we really want or need to do.

It is very important for us to remember that it is actually those who pressure others who are having problems, and not the person being pressured. It is therefore important for us to be sincere and truthful to our self. Listed are some of the ways to help youths say 'NO'

1) Saying 'NO' in a nice and non-threatening way	'Can I offer you a cigarette?'	'No, thank you'
2) Give reason	'What about cigarette?'	'Sorry, I do not smoke'
3) Repeat answer	'Here, the cigarette' 'Try it' 'You are a coward'	'No, thank you' 'No, thank you' 'It's OK, but no, thank you'
4) Give alternative	'Let's go to bar and smoke'	'I am more comfortable watching TV here'
5) Pressure back the person who pressured you	'Just try this cigarette'	'Didn't you hear what I have just said?'
6) Show you stand	'If you are a man, show me your smoke'	'I can't do it, I don't smoke, I don't want the cigarette control my life'
7) Move away from there	'I have the thing (cigarette), do you want to try'	'No, thank you' Move away from there and leave the place.
8) Ignore	'I sell the cheapest cigarette, do you want to buy?'	Continue walking pretending that you did not hear it.
9) Do things together with 'good friends'	'I have the thing (cigarette), do you want to have'	Be with others who are of the same opinion as you
10) Avoid situation		

Appendix 5.4

The Peer Educator logbook

PEER EDUCATOR (PE)
Smoking Prevention

Name :_____

Gender:_____

IC Number :_____

-Photo-

Phone No. :_____(House) _____(h/p)

House Address :_____

_____

School address :_____

_____

Date of attending the Peer Educator Training:_____

_____
Signature of student
(*Name*)

_____
Signature of parents
(*Name*)

_____
Signature of head teacher
(*Name*) Date :_____

PEER EDUCATOR LOG BOOK

Date	Activity	Target group	Location	Notes (Details of activities and target groups)

REFERENCES:

Activities	**Target Group**	**Location**
PT : Personal talk D :Discussion ASC:Anti-smoking campaign O : Outreach GO : Giving opinion HF : Helping friend OT : Others	I : Individual SG :Small group (<10 persons) M : Mass (10 peoples and more	S : School H : Home OSH: Outside from school/home

Appendix 5.5

Log book analysis sheet

Log book no.:_____

School name:_____ School location:_____ Gender: _____

PE's activities	Personal talk (PT)			Session 2-peer educator		
	Small group discussion (D)			Session 3- Communication		
	Giving opinion (GO)			Session 4 - Smart without tobacco		
	Helping friends (HF)			Session 5- Upholding healthy lifestyle		
	Anti-smoking campaign (ASC)			Session 6- Issues related to smoking		
	Outreach (O)			Session 7 - planning and leadership		
	Others (OT)			Others		
Target group	Individual (I)					
	Small group (less than 10 peoples) (SG)					
	Mass (more than 10 peoples (M)					
Location	School (S)					
	Home (H)					
	Outside from school/home (OSH)					

Note:

_____

_____